JOURNAL OF GAS LIGHTING & WATER SUPPLY.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXXII., No. 2604.] TUESDAY, APRIL 8, 1913. [65TH YEAR.

EDITORIAL NOTES.

The Gaslight Directorate Vacancy.

AN official communication from the Gaslight and Coke Company informs us that "the vacancy at the Court of "Directors, caused by the death of Mr. Ulick J. Burke, "has been filled by the appointment of Mr. Henry Woodall. "Mr. John Miles has been elected Deputy-Governor of "the Company in the place of the late Mr. Burke." We congratulate both gentlemen; and we congratulate the Company upon the election of Mr. Henry Woodall, for reasons which have been known to us privately quite apart from the Company, and which reasons emanated some time since from Mr. Burke. The announcement of the appointment, therefore, does not come to us as a surprise; and it fulfils a wish that Mr. Burke long entertained, and which, we know, he earnestly desired to see consummated at a time when he was well and actively discharging his duties as a Director and as Deputy-Governor. While the appointment must be highly gratifying to the Governor of the Company (Sir Corbet Woodall) as the father of the new Director, the appointment is the work of his colleagues for, we take it, the very reasons which appealed to the late Mr. Burke, and which are of a political character.

It does not ill-become us, as the fact is so well known, to mention that the health of Sir Corbet Woodall during the last two or three years has not been of the character which his friends, intimate and otherwise, could and did desire, though at the present time there is an improvement which all his friends are happy to see. Years, too, have to be taken into account, as well as professional calls that periodically take Sir Corbet abroad. These are matters which, we feel safe in saying from our previous knowledge, have weighed with the Directors. The incomparable and invaluable services of the Governor which, aided by loyal colleagues and officers, have completely changed not only the complexion, but the substance, of the fortunes of the Company, must be continued as long as possible; and, to contribute to this end, his duties must be lightened as far as is practicable. The Directors have evidently felt, as did their late Deputy-Governor some time since, that the best way of attaining this object was to have on the Board some one, qualified as an engineer and experienced as a gas administrator, who was at all times in close intercourse with the Governor, and moreover someone animated by the same ideals. Who better, therefore, than the Governor's own son and professional partner? These, we take it—knowing what Mr. Burke felt, and felt so strongly that we believe he would have been willing to resign his position to attain the end in the interests of the Company—are the reasons which have prompted the selection; and they are good reasons, quite apart from Mr. Henry Woodall's own special qualifications as a technical gas administrator. Through him, as a member of the Board, the progressive policy which has in latter years brought so much good for the Company will—whatever befalls—have a strong and consistent advocate and defender. Among those who will heartily welcome the new Director will, we feel sure, be his friends the General Manager (Mr. D. Milne Watson) and the Chief Engineer (Mr. Thomas Goulden), as well as the officers generally.

The Del Monte Prospectus.

THE proprietors of the patents for the Del Monte process have shown an admirable cuteness in the time of issuing their prospectus for capitalizing Oil and Carbon Products, Limited. Perhaps since the original prospectus of the Coalite Company, there has not been any process connected with coal carbonization for the exploitation of which money has been asked from the public that has shown a more speculative basis than this, nor more generous estimates of financial prospects. In time we shall know whether this invention of so-called "national importance" has attracted from the pockets of the public £120,000. The promoters of the venture obviously considered that it would be necessary to offer some strong temptation to the public to subscribe to a non-existent business, patrons for the staple product of which have yet to be found at the price named in the prospectus estimates. Therefore the £120,000 was offered as 10 per cent. cumulative preference shares of £1 each; and, in addition to the 10 per cent., if there are any surplus profits, the holders are to receive one-third part of them. A curious thing about the issue of the prospectus was that it came out on April 1 (this may have been a purely unconscious act on the part of the promoters) and the lists were to be closed on April 4—dates that just prevented useful comment by those technical papers and those journals that are in touch with carbonization work, and the markets in which there will be trading with the produce of any Del Monte plants that may be erected.

It would have been as well, in their own interests, if the proprietors of the Del Monte patents had made a destructive criticism (if they were able to do so) of Mr. W. J. A. Butterfield's report on the process, as that report rather discounts their claims, and the roseate calculations made by Mr. Bertram Blount, which form the cardinal feature of the prospectus. Time will show, if money is provided for the erection of plants, whose figures are nearer the mark—Mr. Butterfield's or Mr. Blount's. We shall hold the opinion, until there is substantial proof to the contrary, that the former expert's computations will be nearer the truth, subject, of course, to the public being buyers of the fuel as produced by low-temperature carbonization as practised in the Del Monte process. This is very doubtful, having in mind what Mr. Butterfield had to say about the greater proportion of the discharge from the trial plant being no better than ordinary gas-works coke, and only 20 per cent. of it embodying a percentage of volatile matter that would constitute an ignitable and free-burning fuel in an ordinary domestic grate. It is rather amusing, in the face of what Mr. Butterfield found in the Del Monte trial plant, to learn from the promoter's literature that, in other carbonization processes, the experience has been a high-temperature coke on the outside of the charge, and a low-temperature coke in the centre. If the framers of the prospectus had consulted Mr. Butterfield's report on their own process, to find out what should be accounted bad for low-temperature process working, they could not have reproduced his finding with greater exactitude. When, too, we see that, according to the same promoting literature, retorts that have been made of a section (a rectangular section for instance, with rounded corners) suitable for the rapid penetration of heat to the centre of the charge have proved utter failures, we are not enamoured of the knowledge possessed on carbonizing matters by the authors of the statement.

When we look at the profits pictured by Mr. Bertram Blount, with indications on the part of the writers of the prospectus and the accompanying literature that these profits may be stretched by still higher yields of valuable products, then we sincerely sympathize with the promoters of the Company that they apparently have not the money in their own possession to work a system that, as the years pass, would build up for them fabulous fortunes. Mr. Blount shows in his "estimates" (the word was never more fortunately used) that, with a capital expenditure of £120,000, a profit of £57,628 is to be made, or 5s. 9d. per ton on 200,000 tons of coal—that is, if the Company do not themselves distil the tar oils, but sell the crude stuff. If, however, they like to spend another £30,000 on a refinery, then the profit will fly up to £91,233, or 9s. 1d. per ton of coal. Seeing that there is an additional £33,605 profit to be obtained in one year by spending £30,000, after allowing 10 per cent. depreciation on it, the Company would, of course, be very stupid not to have a distilling plant of their

own. The more we consider the matter, the more we are constrained to admire the great self-sacrifice of these people in allowing the public to share with them the profits, instead of keeping them all for themselves. At the rates at which profits can be made, the capital should be more than returned to the shareholders in two years. The Company could well afford to fight the big foreign trusts and combinations who have made things so warm, through the price of petrol, for motor-car owners; for even if they ran down the price of the Del Monte produced motor spirit (benzol) to 3d. per gallon, instead of the 1s. allowed by Mr. Blount, a profit of £46,000 would be made on the capital expenditure of £150,000, which would give 23 per cent. on the capital invested. It is all very wonderful.

The process itself, too, seems capable of somewhat divergent results—results differing so widely in some respects as to create fresh knowledge regarding the yield capacities of certain coals. We remark, in one part of the newly issued literature before us, that 14 to 18 cwt. of smokeless fuel will be obtained. Mr. Blount in his calculations reckons 15 cwt., of which we make out about 90 per cent. would fetch (if the public be willing to pay at this rate) 24s. per ton, and 10 per cent. 8s. Mr. Butterfield took 14 cwt. at 15s. In one place, a production of 14 to 25 gallons of tar oil is spoken of, of which it is said 50 per cent. is motor spirit. Mr. Blount calculates 14½ gallons of tar oil, from which 6 gallons of motor spirit will be obtained; and he prices the latter at 1s. per gallon, as against 10d. in Mr. Butterfield's computations. Then the literature informs us that 30 to 47 lbs. of sulphate of ammonia per ton of coal carbonized can be obtained. Mr. Blount tells of one test he made in which 41 lbs. were realized; and he takes in his calculations 27 lbs, and the price £14 per ton—the same as Mr. Butterfield. Fulfilment of Mr. Blount's figures depends on whether the public are prepared to pay 24s. per ton for a smokeless fuel, on whether the estimated prices of motor spirit and other tar oil products are not shattered by the new conditions, and on whether the price of sulphate of ammonia keeps up to the figure that is the highest that has ruled for a great number of years. However, assuming the public does take to smokeless solid fuel, there is a big difference between Mr. Blount's 9s. 1d. per ton profit and Mr. Butterfield's 1s. 6d. We see that a Director's holding need not exceed £50. That is a very thoughtful provision, and ultimately it may be a useful one—for the Directors.

By the way, ministerial answers to questions in Parliament are sometimes the shadows of coming events. According to the Home Secretary's reply to an interrogation the other night, the tax on motor spirit has not yet been affected by competitors; but of the possibility of developments, the Government has not lost sight. The competitors, he added, could be taxed, under the definition of motor spirit, if they should come into general use, on their capacity being established for providing reasonably efficient motive power.

The Informal.

Excepting that the title is a traditional one, and there is no set organization, with inflexible rules with which to comply, it becomes more difficult year by year to justify attaching the word "Informal" to the meeting of Scottish Gas Engineers and Managers, as held last week. The proceedings take much the same course as the formal meetings of the District Associations, save that the subject-matter for discussion is prepared by the Chairman presiding over the meeting, and all gas engineers and managers, and anyone who is not, but who is invited to be present, are heartily welcomed, and are at liberty to join in the discussion. The Chairman at this year's "informal" was Mr. S. Milne, of Aberdeen; and, in his address, he supplied sufficient roving-ground for those inclined for controversy over technical policy and working details to engage in several days' discussion, instead of one, to begin and end in a single sitting. There was a superabundance of choice; but every section of the address has its interest and its lessons. The forward commercial policy in Aberdeen—a policy for which the gas administrators in the Granite City are noted among Scotch gas men—has compelled, especially through the last move (the free supply of gas-cookers), the determination of an extension of the coal-carbonizing plant. Capital expenditure is inseparable from large expansions of business; and therefore when necessity commands additional capital expenditure, providing previous outlay has been wisely depreciated (as appears from the returns to be the case at Aberdeen), there is something over which to rejoice. The fact of the need of additional capital expenditure is the very best testimony that Mr. Milne can offer as to the soundness of the liberal commercial policy that is being pursued in the service of the community and for the well-being also of the undertaking.

The capital expenditure on new coal-carbonizing plant would have been long since overdue, if it had not been for the stroke of good generalship that resolved to call in the aid of carburetted water-gas plant until a decision could be made from experience as to the type of carbonizing plant to be adopted; and, while the water-gas plant effected this purpose, it at the same time gave the gas undertaking what was required—an ancillary to the coal-gas producing plant that could give prompt service with a small amount of labour, and render assistance during such times of labour disturbance as the coal strike of a year ago. There are arguments, both for and against carburetted water-gas plants, which have been used so often that they have become mere platitudes. One is the vagarious course of the oil market; but coal has not in these days much of which to boast in this respect. When the arguments against carburetted water-gas production are duly marshalled, the total does not rise superior to the first law of supply of any public necessary, which is that nothing that is humanly and reasonably possible shall be left undone to protect the permanence of that supply. There would have been in many cases an infraction of the law twelve months since had it not been for the reinforcement of production by carburetted water-gas installations. Mr. Milne's idea is that no large works ought to be without a carburetted water-gas plant equal to 25 per cent. of the maximum output. That is fairly modest, seeing that many works, with carburetted water-gas plant, when the oil and coke markets are favourable, work normally at round about 30 per cent. Save in maximum times, they would be able to do so with Mr. Milne's 25 per cent. But what is the normal percentage working might well be taken as the percentage of the maximum make in determining the size of plant, though there, again, some gas-works can show a considerable margin in capacity over the working figure, and are, in consequence, sometimes tempted to exceed the normal supply of carburetted water gas to the sacrifice of reputation among the consumers.

However, the time has arrived when additional coal-gas plant must be erected at Aberdeen; and Woodall-Duckham vertical settings have been selected. The fact that vertical retorts were to be mentioned in the address suggested an invitation to engineers to be present from the shale oil-works where vertical retorts were first brought into practical service; and though these gentlemen did not throw much new light on the subject of carbonization in verticals, their presence and speeches added interest to the occasion—especially the one friendly wit and critic who suggested that if, in shale-oil works, as much mechanical operation were adopted in connection with vertical retorts as was done in gas-works, they would use up for lubrication purposes all the oil produced. There seems to be a hidden view there on the part of our shale oil friends that in gas-works the mechanical part is overdone; but a closer acquaintance with the conditions might change the notion. The point is that in gas-works (though gas-works may be good customers for lubricants) the application, within reason, of mechanical arrangements pays, and pays well. As Mr. Milne showed in his address, he calculates that the overall expenditure for the vertical settings and associated plant will run him into some £4000 in excess of what horizontal plant of equal producing power would have cost the Gas Department; but the justification is found in the saving of labour in this particular part of manufacturing operations, though other departments, where the work is more congenial, now require more hands than they ever did. What is the capital value per man displaced in retort-house work? The question is suggested by the tentative manner in which Mr. Milne puts the point, "if one agrees that for every man one can do "without, one is justified in spending £1000 of capital," &c. That is a somewhat novel way of putting the matter. A very interesting discussion might take place upon it, although the estimates might vary a bit with the locality, and some variations of opinion might be found as to the fair basis of appraising relatively human intelligence and mechanical operation. With £1000 capital expenditure, the displacement of a £2 a week man would give a full 10 per cent. for interest and depreciation charges combined.

But if we begin calculating on these lines, we shall have gas administrators indulging in reckonings to ascertain whether, and if so what, capital expenditure would be admissible to warrant them in deposing their gas engineer. However, on the general subject of verticals, Mr. Milne gave his reasons for preferring the continuous system.

From carbonization, the address passed to district work in general, and main laying in particular; and the details supply many points for the narration of experiences and personal preferences. Mr. Milne is confident that we are on the eve of a considerable revolution in the substitution of steel tubes for cast iron; and he gives reasons for his belief. In connection with certain of the points that are made in the address, they appear to be somewhat toned by local experience; and, while not disputing anything that Mr. Milne says on the various attendant details, it may be remarked that this question of the substitution of steel for cast iron is one upon which one cannot dogmatize, and deal with in a manner that can have general application. Practically half the case against cast-iron mains that appears in the address would, under different subsoil conditions, fall to the ground. The point made, that in these days of heavy vehicular traffic, cast-iron pipes must be laid at a greater depth than steel, is one the determination of which is not always left to the discretion of the gas engineer; but the minimum depth of his pipes is often determined, irrespective of any consideration as to material, by a non-technical Parliamentary Committee and a road authority who do not understand that the safety of cast-iron pipes depends as much, if not more so, upon the bedding conditions as upon depth. There cannot be too much insistence regarding the importance of properly coating steel mains. Associated with this a point is raised upon which we should like to hear whether others have had any useful experience; and it is as to whether the use of air in oxide of iron revivification has any effect upon the inside of steel pipes. There are observations, interesting and suggestive, upon jointing and high-pressure gas distribution. In these days of stand-by clauses, the publication in the address of the stand-by rentals charged in Aberdeen for meters of different sizes, where the consumption does not reach the exemption line, will be useful. The bases of computation are very liberal to the consumers. Equally interesting will be found the information given as to the free supply of gas appliances, and the conditions attaching to this line of business development. Mr. Milne's address did not touch upon any subject that is not a live one at the present time; and this fact enhances its value.

The Life of Vertical Retorts.

In the paper that Mr. Roland B. Glover read at the meeting of the Manchester Junior Association at St. Helens on Saturday week, as published in our last issue, there is one feature that is interesting above all others. Time alone can complete the experience of vertical retort settings; but time is building up a character for them that must be as disconcerting to those who predicted all manner of evil concerning their life behaviour, as it is gratifying to those who placed an early faith in them. We have had productive results, and confirmation, from many different quarters under a variety of conditions of working; and there is now no lack of testimony in that regard. But the evidence that can only come with time is as to the durability of the settings under the strain of constant work. We have had information from Berlin as to the long life and low costs for repairs that are being experienced in connection with the Dessau system. On the Glover-West system, the original trial setting at St. Helens is the oldest representative in its line. There is the evidence in Mr. Roland Glover's paper that it has now been at work nearly five years, with only three brief stoppages for minor repairs. The setting is still running; and the indications are such as to prohibit any attempt at making an estimate as to the time when any serious or partial reconstruction will be necessary. We hope that there will be no occasion to remove the setting, but that it will be allowed to go on making history as the first representative of its kind. The experience of it to the present time speaks well for the perfection of the original design and character of its construction.

As the author of the paper showed, the conditions of continuous vertical retort operation are theoretically particularly favourable to long working careers; but the point as to the relative strains and stresses to which vertical retorts on the intermittent and continuous system are subjected would be a matter well worth further investigation. There can be little question that the dumping of a full charge of cold coal into a hot retort will produce chilling and contraction; but whether to any appreciable detrimental extent is another matter. With strongly intumescing coal such a charge must for a brief time cause strain; and, as the temperature of the charge increases, there must be a certain expansion, which carbonization and shrinkage quickly relieves. But are the contraction and expansion actually of the extent imagined? The charge in an intermittent retort is not so large as the charge in a single continuous retort; and in the length of the larger continuously worked retort, the charge being at different stages of carbonization, from cold (or comparatively cold) coal to completed carbonization, there may be a different order of strains from those existent in the smaller intermittent retort. Theoretically, the argument appears to be on the side of Mr. Glover; but frankly the more we think over the conditions, the less satisfied are we that the relative effects in this regard have been conclusively settled, or that on the one side or the other they are of a comparatively more serious nature. As a matter of fact, in connection with retort life, the two systems appear to be running a neck-and-neck race. The matter is worth looking into a little more closely, to ascertain whether actual effects in the matter of stability bear out theoretical reasoning. We only want to know the truth, in view of published experiences.

Junior Interest and Salaries.

The Manchester Junior Association is the oldest of its kind in the gas industry; and it has exceptional opportunities, owing to location. We look to the pioneer Junior Association to set a good example to the others, by all—not merely a few—of the members taking deep interest in the work. The maximum interest and activity of all means the maximum good. Taking literally some parts, and reading between the lines of other parts, of the address which the new President (Mr. W. L. Heald, of Preston) delivered on Saturday, it would seem that there is room for an improvement in the interest of some of the members. We are sorry indeed, for example, to learn that the University course of lectures is to be dropped this session on account of the comparatively small attendance. Through the University, and the countenance and aid of Professor Harold B. Dixon, the junior gas men in the Manchester district have opportunities such as are not met with anywhere else other than in the Yorkshire district through the Leeds University. Before these lectures were started, the Manchester juniors considered they had a grievance, in that, with a University in their midst, they had not the same advantages as Leeds offered to the junior workers in the Yorkshire area. The grievance was removed, largely through the kind offices of Professor Dixon; but already there is announced a blank session through insufficient interest. There are many junior gas men in other parts of the country who, if it were possible to transfer them to the Manchester district in place of those who neglect the opportunities offered them, would make an encouraging numerical showing at such lectures. We trust that the cessation of the lectures is only a temporary one, and that they will be revived. There is a ray of hope in Mr. Heald's address.

Among several other matters that contributed to the composition of the President's address was that of the pay of technical assistants. Some technical assistants are paid as they should be by conscientious employers; but it is quite notorious that others are not. The latter have a grievance; and we have not hesitated in times past to say so. Their rates of pay are not better in some cases than a non-technically educated clerk or foreman, and often workmen are found who are, on the same works, receiving more in wages than some of the members of the technical staff are doing. This is not right. There are directors who carefully see that they are comfortably recompensed for their own services, but are less keen in seeing that they do not themselves sink into indifference in dealing with level-handedness with the question of the salaries of juniors. The salary is probably far more important to the junior than the fees are to the director; and it is unfortunate, in the interests of justice, that certain of the latter cannot be made to remember this, by temporarily causing them to change places with the juniors. Thankful are we to say that all directors are not as these. On the other hand, there are juniors whose want of industry, skill, and sense of responsibility, is such that their services

are hardly worth recompensing at all. But we are glad to say that we have met with few such juniors in the gas industry. Mr. Heald did not say so much as we have done on this subject in his address. His reference to it was only of an incidental nature, as being one over which some juniors, less fortunate in their position than others, have cause for complaint. We hardly think, however, that his allusion to an editorial article in the "JOURNAL" for Jan. 2, 1912, exactly conveys what was then said; but this is probably due to the brevity of his remarks in this connection. One interesting announcement that Mr. Heald made was that his chief (Mr. Samuel Tagg) has offered to the Association two prizes for the best prepared compositions describing visits of the members to works.

A Model Specification for Coal.

For some time we have been looking for the model specification and conditions of contract for purchasing coal which it was known was under preparation jointly by London firms of coal contractors and a Committee representing the Associated Municipal Electrical Engineers of Greater London. The specification will be of interest rather than use to those responsible for the purchase of gas coals, as something more than the calorific value of coal and its moisture comes into question with them. The matter of small does not worry them, seeing that the small of any class of gas-making coal is as good to them as the large of the same class. There are (as will be seen from the specification as published in our news columns) standard figures for calorific value, moisture, and small, and sulphur is also limited. But running over the main figures, it seems to us that the sellers have got somewhat the better of the bargain. Where the calorific value per pound of coal rises above the standard, a proportionate increase in price is to be paid by the buyer; where it falls below the standard, the seller is to forfeit some of the contract price. Looking at the standard calorific figures, we rather fancy the buyers will, through the increased price they may be called upon to pay, have some difficulty in prejudging exactly the amount of their coal bill. The sellers, too, are pretty safe in the matter of moisture. Nothing is said regarding ash; but with a calorific value standard this perhaps is not an essential, as a high percentage would depreciate the calorific value to the disadvantage of the sellers. The samples that are to be taken for testing will be submitted to laboratory tests, upon which in gas-making, as showing the actual value of coal, we have not much reliance. However, the electrical engineers believe they have arrived at a specification that will ensure them value for money in their coal purchases; but we have an idea the electrical engineers will be the first to try to get the specification amended. Anyway they are making an interesting experiment.

Outside the Fold.

It will come as somewhat of a surprise to many people to learn that, at the lowest computation, the non-unionists in the South Wales collieries number upwards of 50,000. The force, too, is proved to be an ever-increasing one—with, of course, a corresponding decrease in the strength of the Miners' Federation. In some districts particularly, since the national coal strike last year, non-unionism has been gaining ground; and at the annual conference of the Federation last week, it was agreed that the time had arrived when something should be done to better the state of affairs from the trade union point of view. Persuasion, as generally understood, is obviously ineffectual; so recourse is to be had to other methods with which organized workers (and the public) have become familiar. It has been decided that non-unionists are to be given until the 30th inst. to join the fold, and that a stoppage shall be ordered at all collieries employing non-unionists after that date. The progress of this campaign will be watched with anxiety, though it is to be hoped that it will prove unsuccessful to the instigators. That the Federation is in a bad position is shown by the membership, which is about 114,000, as compared with 144,000 in 1908—each year showing a consistent decrease, in spite of the increasing number of men employed.

Municipal Income-Tax.

The dispute in which the Leeds Corporation have for some time past been engaged with the Income-Tax Commissioners has at last been finally terminated by the judgment of the House of Lords. The case was stated to be a test one; and in its passage through the Courts, it has enjoyed quite an exciting career. In the first place, the King's Bench Division upheld the decision of the Income-Tax Commissioners; but in the Court of Appeal this judgment was, by a majority, reversed. Now the House of Lords have decided against the majority view of the Court of Appeal, and have restored the decision of Mr. Justice Hamilton in the King's Bench. The point was originally raised as a special case—the Corporation objecting to the assessment for income-tax by the Commissioners of a sum of £78,000, on which the Corporation contended that the tax had already been paid by their various municipal undertakings. As stated, the facts were that, by the Corporation Act of 1901, the loans obtained previously were gathered into one department, and the interest and capital charges on all loans were put into one pocket and charged *pari passu* to the revenue of the Corporation. To pay all the interest on the loans in the year in question, the Corporation required £285,000, which was paid, and the income-tax thereon deducted from the amounts due to the stockholders. From the gas, water, and electricity works, the tramways, city fund, and consolidated fund, the Corporation received £270,000, derived from taxable property of different kinds; and upon the whole of this amount tax had been paid by the Corporation.

Earlier Judgments.

Mr. Justice Hamilton, in the course of his judgment, said that there being an aggregate excess of £78,000 in respect of water-works, gas-works, tramways, and city fund, it was contended by the Corporation that to this extent they were entitled to retain these deductions by way of income-tax which they had made as against their stockholders, because they were entitled to claim that, in the contemplation of the law, they had paid, or might have paid, interest on the other part of the undertakings, by the application to this purpose of what he might call the borough rate undertaking excesses, and, having paid income-tax already on this £78,000, as part of their total taxable income of £270,000, it would be calling upon them to pay the tax twice over on the same sum, if they were not entitled to retain the several amounts deducted from stockholders, and to assert that the interest had been paid out of the surpluses that in the aggregate amounted to this sum. As stated, he dissented from this view; but the majority judgment of the Court of Appeal did not. The Master of the Rolls said the question was really whether the Corporation could apply the profits from one municipal undertaking to the payment of interest on loans for another. He confessed that the Act of 1901 was full of difficulties, but came to the conclusion that, under it, the interest on the loans was no longer payable out of the net receipts of each separate undertaking. In the opinion of Lord Justice Farwell, it was clear that income-tax was not payable twice over on the same profits and gains; and if the Crown succeeded, the Corporation would be paying twice. He remarked that he found nothing at all in the Act in question—that of 1901—which could be taken to support the contention of the Crown.

In the House of Lords.

In the course of a lengthy judgment, the Lord Chancellor said the crucial question was whether, even if the old securities were abrogated and a new security substituted, so as to provide for the case of a deficiency, should liquidation in some form be necessary, the original statutory directions for the application of rents and profits were left standing and operative in the meantime, so that the Corporation were bound to continue to apply their income from the various undertakings to the payment of interest on the loans specifically charged on them, and, as regarded any surplus, in relief of the particular rates and to the other purposes for which it was ear-marked originally. He was unable, after consideration of the different sections of the Act of 1901, to arrive at the conclusion of the Master of the Rolls, that the interest on the loans was no longer payable out of the net receipts of the particular undertakings to which they belonged, and that the net receipts could not be ear-marked for that purpose. He thought that no other income than the profits of the several undertakings and properties was operatively and effectively charged with payment of the interest on the various loans. The appeal ought therefore to be allowed, and the decision of Mr. Justice Hamilton restored. This judgment of the House of Lords, it may be added, was a unanimous one.

PERSONAL.

It is announced that Sir GUY DOUGLAS ARTHUR FLEETWOOD WILSON will, on his retirement from the public service, join the Board of the Imperial Continental Gas Association, in the place of the late Mr. Leonard Rodwell Wilkinson.

Mr. J. LAWSON, who for many years represented Messrs. Ashmore, Benson, Pease, and Co., in the capacity of their London Manager, has now joined the Board and been appointed Managing-Director of Messrs. Edward Cockey and Sons, Limited, of Frome, who are well known as makers of gas-works plant and constructional engineers.

The great increase in the growth of Doncaster and the district has entailed a large amount of extra work at the gas-works; and at their meeting last week, the Corporation increased the salary of the Gas Engineer and Manager (Mr. ROBERT WATSON) by £50 per annum, with a further rise of like amount at the end of one year. Several other increases of salaries in the Gas Department were sanctioned.

As at present arranged, the members of the Institution of Gas Engineers will have an opportunity, on the occasion of their jubilee meeting, of renewing their acquaintance with a prominent American chemical engineer in the person of Dr. ARTHUR H. ELLIOTT, who was for some years associated with the Consolidated Gas Company of New York. He hopes to arrive in England a few days before the meeting.

We learn from the Secretary of the Gaslight and Coke Company (Mr. H. Rayner) that the vacancy on the Court of Directors of the Company, caused by the death of Mr. Ulick J. Burke, has been filled by the appointment of Mr. HENRY WOODALL. Mr. JOHN MILES has been elected Deputy-Governor of the Company, in the place of the late Mr. Burke. Reference to this communication is made in our editorial columns.

Mr. ROBERT HAWARD, the Clerk at the Heywood Corporation Gas-Works, who is leaving this country for Canada, was recently the recipient of testimonials of the regard of the employees at the works and of his fellow-members of the local Municipal Officers' Association. The former gave him a travelling rug and a shaving outfit, and the latter a handsome travelling bag; the presentation being made in each case, on behalf of the donors, by Mr. W. Whatmough, the Gas Engineer and Manager, who is also the President of the Association.

An item is noted with regret in the "Co-Partners' Magazine" of the Gaslight and Coke Company—the retirement from the Engineering Staff, owing to ill-health, of Mr. JOHN HORNBY. It is added that Mr. Hornby entered the service in 1879 as assistant to the late Mr. Robert Morton, Engineer of the London Gaslight Company, at their works, now the Gaslight and Coke Company's Nine Elms station. He was transferred to Beckton in 1892, as an Assistant Engineer, and remained there until 1908, when he was appointed Assistant at the Nine Elms station. In 1910, he was placed in temporary charge of Bromley, during the absence of Mr. Birkett, who was for a while transferred to Stratford. On Mr. Birkett's return to Bromley, Mr. Hornby was given the post of an assistant to the Chief Engineer at Westminster. He has, it is further pointed out, taken great interest in technical education, and started the first "Gas Manufacture" class organized in the country; and he has written a number of text-books.

OBITUARY.

THOMAS EASTON DEVONSHIRE.

WE regret to record the death last Tuesday, at his residence at Chislehurst, of Mr. Thomas Easton Devonshire, the Chairman of the Antwerp Water-Works Company. He had been very ill, and was unable to preside at the meeting of the Company held on Monday last week (noticed elsewhere), when his condition was so serious that no hopes of his recovery were entertained. In addition to his connection with the above-named Company, Mr. Devonshire was a Director of the Seville Water-Works Company, Limited. He will, however, be best remembered by most "JOURNAL" readers as a member of the Institution of Water Engineers, in the proceedings of which body he took a prominent part. He was elected upon the General Council in 1910; and two years previously he was appointed Chairman of the Managing Committee for the National Registration of Plumbers. He was an authority on the subject of the mechanical filtration of water; and he possessed a thorough knowledge of the French language. These qualifications were freely placed at the service of the Institution. On the occasion of the visit to Belgium in 1904, he read a paper on the Antwerp Water-Works, and translated one giving a description of the Gileppe dam at the Verviers works. The following year he submitted a paper on the steel and concrete construction at the former works. When the members went to Paris in 1907, Mr. Devonshire not only gave them an interesting historical account of the water supply of the city, but translated three papers describing the works of the Compagnie Générale des Eaux de la Bauliene and the plant for the purification of the water supplied to the city and suburbs. Apart from these important contributions to the "Transactions" for the year, he rendered useful service in other ways. At the succeeding winter meeting, he submitted some notes on the water supply of Paris and its environs. The last subject dealt with by him was that of "Works Management"—a paper which was the joint production of himself and Mr. William Matthews being read at the winter meeting of the Institution in 1911. Mr. Devonshire was an associate member of the Institution of Civil Engineers, having been admitted in May, 1883. The funeral took place last Friday afternoon, at St. Nicholas Church, Chislehurst.

The death is announced of Mr. JAMES M'NAIR, a former Gas Manager of Wishaw. Latterly he had been the owner of the Kilmaurs Gas-Works.

The death occurred last Thursday morning, in his eighty-eighth year, of Viscount LLANDAFF, who was Home Secretary during Lord Salisbury's Administration from 1886 till he was succeeded, on a change of Government in 1892, by the present Prime Minister. Lord Llandaff was Chairman of the Royal Commission on the London Water Supply which sat for two years from November, 1897, and whose first report, made in January, 1899, led to the adoption by the Water Companies of an intercommunication scheme. The further report, published a year later, condemned the exorbitant demands made the London County Council, and held that in case of purchase the procedure of the Lands Clauses Act should be followed. The Commissioners directed attention to the enormous expense of alternative sources of supply, especially the suggested resort to Wales, and expressed the opinion that the Lea Valley, Kent, and the Thames would be equal to all probable demands for water until the year 1941. They rejected the schemes of purchase by several authorities, and decided in favour of a Water Board, which was established by the Metropolitan Water Act, 1902, and now has control of the supply.

Since the last meeting of the Bristol Gas Company, two of the members of the Board have been removed by death—one being the Chairman, Alderman J. W. S. DIX, who died last Wednesday, at the advanced age of eighty-two. The event was unusually pathetic from the fact that the deceased sustained a sad bereavement by the loss of his wife on the preceding Saturday, and her funeral took place on the day he was called to his rest. He was ill a few months since, but recovered so far as to take up his former interests; and he presided at the last meeting of the Company. He was in the city on the 29th ult., and it is supposed he took a chill, to the effects of which, combined with the blow he had sustained, he succumbed. For many years, Mr. Dix was in the City Council, of which he was the oldest member; and from 1891 to the time of his death he served as an Alderman. He was made a Justice of the Peace in 1898. He was a member of the Committee of the Bristol Dispensary, and a Life Governor of the Bristol General Hospital; also a member of the Royal Sussex Lodge of Freemasons. His death will be sincerely regretted by a very wide circle, and he will be greatly missed; for he was a fine old man of a type which is gradually disappearing.

The Corporation of Liverpool have just lost one of their oldest officials by the death, in his sixty-second year, of Mr. THOMAS DUNCANSON, M.Inst.C.E., the Assistant Water Engineer. He was the son of Mr. Alexander Duncanson, late Deputy Water Engineer, and entered the service of the Corporation as an apprentice in 1867. On the completion of his articles, he was appointed as an Engineering Assistant, and worked with the late Dr. G. F. Deacon in the preparation of the preliminary and parliamentary estimates for the Vyrnwy works. In 1879, he was appointed Engineer to the Fylde Water Board; but after a service of two years he re-entered the employ of the Corporation, and was engaged at Lake Vyrnwy as principal draughtsman during the whole time the works were under construction. On their completion in 1891, he was appointed Assistant-Engineer, and from that time up till his death he acted in this capacity in matters relating to the pumping-stations, the distribution of water in the Liverpool district, the prevention of waste, and the assessment of charges. Mr. Duncanson was for many years a member of the Liverpool Engineering Society, and was President in 1907. He was admitted into the Institution of Civil Engineers as an associate member in 1884, and was transferred to the membership list in 1903. At a meeting of the Liverpool City Council last Wednesday, Colonel Porter, the Chairman of the Water Committee, referred in feeling terms to the death of Mr. Duncanson, and paid a warm tribute to his useful work, especially in regard to Lake Vyrnwy.

The Directorate of the Brentford Gas Company.

We learn that Mr. Reginald James Neville Neville, M.P., has been chosen by the Directors of the Brentford Gas Company as the successor of the late Mr. Ulick J. Burke in the chairmanship. Mr. Neville has been a member of the Board for twenty years—joining it in 1893. The vacancy thus created in the directorate has been filled by the appointment of Mr. William Mann, who retires from the secretaryship after forty-five years' service (since 1868). He is the eldest son of the late Mr. William Mann, the Engineer of the old City of London Gas Company. He is succeeded by the present Accountant, Mr. John T. Croxford, who has been in the Company's service since 1876. He was formerly the Accountant of the Company, and was appointed Secretary on the retirement of Mr. William Croxford, through failing health, early in 1900. His successor in both offices is the nephew of the former Secretary.

ELECTRICITY SUPPLY MEMORANDA.

A YEAR has passed since the great coal strike. When we were in the midst of that unhappy and industry crushing event, there was jubilant talk as to the wholesome effect it was having upon the business of electricity supply. "It's an ill wind that blows nobody good," said the publicity representatives of the electricity suppliers; and the people that were benefiting were declared to be the latter. Truth will out; and it is "out" now that the electrical history of the past year has been written in financial accounts and reports of meetings at which the affairs of the electricity concerns of the country have been dealt with. Those connections that were going in wholesale, that mad rush for electricity for domestic purposes, that large turn-over of manufacturers from gas and steam to electricity—where are these things all represented in that history? The gas industry did well last year in increased business; but the abnormal increase that we had been led to anticipate in the case of the electricity industry has shrunk to the substance of a normal increase; and, as a matter of fact, some undertakings acknowledge that they have only been marking time. That is the result, so far as we can ascertain by a scrutiny of the material to hand. The "ill wind" seems to have blown more good for the active participants in the strife of a year ago than for the electricity supply industry. Already, as the accounts show nothing much to boast about, there is another cry for more publicity, and for more united effort in the matter of publicity. The difficulty, however, is to get the undertakings all on common ground for the purpose. A large proportion of them are municipal ones, and are not inclined to devote large sums to the purpose. According to local conditions, different concerns have different lines of business with which to contend. The large company with a purely residential area to supply, sees safety in keeping somewhat closely to the lighting business, and doing little in the way of trying to develop the intermittent use of low-priced units for other domestic purposes. Without a good continuous power load, the short-hour use of low-priced units for cooking at stated times of the day, and for heating in the winter when the maximum lighting load obtains, are not such lucrative propositions as many electricians fancy. Where such supplies can be made supplementary to a power load, different considerations perhaps come in. Some electricity undertakings have done extremely well out of their power loads where the local circumstances have been propitious; but there are other undertakings which show that the farther they have spread their business from lighting, their dividends have receded or have remained stationary, although they are doing a larger business in units, and their field of capital expenditure has been extended considerably. If the present position tells a tale at all, it is that electricity supply administrators should study well the character of their areas, to ascertain whether or not they are really going to improve the fortunes of the concerns by pushing their business in low-priced units outwards, unless that business is of a long-hour and constant character.

The Statement and the Fact.

Why Is It?

The point is suggested as the result of observation of the experiences of electricity undertakings in districts of vastly varying character; and reference to it is not a sign of any trepidation on the part of the gas industry. The little table as to dividend movements that was published in the "Memoranda" on March 25 told a tale of several London concerns that are not paying the shareholders such high dividends now as eight years ago, when there was not the anxiety that has since been seen on the part of some electrical enthusiasts to supply low-priced units; and this retrogressive or stationary dividend experience belongs to a period when there has been an expansion of business and lower generating costs through partly the larger application of turbine plant and greater attention to details. The profits from the additional lighting business and the economies in generating costs have gone somewhere. Where? Certainly not into the pockets of the shareholders, nor to any extent into the pockets of the lighting consumers. There is no question about it that those Metropolitan electric supply companies that have been paying the steadiest dividends are those that have a good lighting load and little else. It may be pointed out in reply that there has been the coal strike, higher coal prices, and National Insurance to increase the outgoings. These only apply to recent times, and not to the whole of the past eight years. Be it remembered, too, that the progress in generation has, despite the higher coal prices, brought generating costs down for the past year to below what they were eight years ago. These are stubborn facts. The position is one for electricity supply concerns to closely analyze to ascertain whether or not under local conditions present policy is more politic than that of the past. Perhaps the dividends that were paid a few years ago were higher than were warranted, with a fair allowance for depreciation and reserve.

Counsel and Policy.

The gratuitous counsel of some people who probably have not much money invested in electricity concerns is that the managements should adopt a more militant attitude, and should do much more in popularizing the use of energy for domestic purposes. Some managements with good dividends for their shareholders year after year are described as lethargic, because they do not show any great desire to fight for a class of business that is ill-suited to profitable electricity generation, distribution, and sale, when all charges are properly apportioned. They are urged to come out of their back-street shells into the open, and all to encourage the greater use of low-priced units for domestic purposes. There is no harm in them coming out into the open; that is the proper thing for men of commerce to do, but the object suggested is another matter. The London companies are reproached for not having done more in trying to develop electric cooking. But the London companies, while not ignoring the matter altogether, are evidently looking farther ahead to the effects that are likely to arise were they to do an intermittent business of any considerable magnitude in this connection; and their attitude at the present time is that of indulging any of their customers who desire this sort of thing, and of showing a sufficient interest in the matter to prevent them being accused of being unfriendly to those who are endeavouring to prosecute a trade in electric cookers and utensils for their personal advantage. Few of the chairmen of the Metropolitan companies have referred to the subject (according to the published reports) at the meetings of their shareholders; but those who have done so are, in effect, reviled for their *suaviter in modo*. In the opinion of some critics, a "gentlemanly" manner does not fit the business man and his trading. To have given satisfaction in certain quarters, the chairmen should have spoken of "poisonous fumes" which do not exist, should have urged the great disparity in shrinkage (which need not exist) between joints cooked in gas-ovens and electric-ovens. But of the shortcomings of electric-ovens, not a word. That would have been the satisfactory manner to some of their advisers. In the case of the Brompton and Kensington Company, they are doing something more than the others by demonstrating electric cooking in an all-electric restaurant. But the Chairman, at the meeting of the shareholders, discreetly said the Directors did not conceal from themselves that there was a speculative element in this departure. Even so, it was one which their surplus reserve justified them entering upon. It was only recently, however, that Mr. T. Roles, the Electrical Engineer of Bradford, stated that, in the direction of cooking, no great headway could be expected by any electricity undertaking where gas was supplied at 3s., or under, per 1000 cubic feet unless electricity was sold at ½d. per unit.

Some Trading Experiences.

Most of the London electricity supply companies last year had increases in business, but the percentages were not large. We have suggested before, and the idea is supported by the "Electrical Times," that it would be enlightening if the electricity supply undertakings were to separate their sales figures, so as to show the quantity of energy supplied for heating and "cooking" apart from power. The mixing-up of figures as at present does not inform one as to progress in their various branches of trading; and with separation there would be some further ground upon which to make discovery of causes that produce certain effects. In the case of the St. James and Pall Mall Company, in whose area consumption is principally for lighting, the Chairman stated that the Board regretted that the business was not by any means so elastic as they could hope for. This is a Company that need not trouble about anything else. They go on paying the good dividend of 10 per cent. year after year. The Charing Cross (West End and City) Electric Supply Company on their West-end undertaking pay their ordinary shareholders a dividend of 5 per cent.; but from their City concern (which has half its sales for power and heating, and the other half for lighting), the ordinary shareholders have not received any dividend. The City of London Company, on the other hand, now pay a dividend of 8 per cent.; and a bonus of 1 per cent. was distributed this last year by taking half the fund accumulated for dividend equalization. In the case of some of the companies, the power load has now reached such dimensions that, in units, it exceeds that of the lighting sales. But these concerns are not paying such good dividends as those depending mainly on lighting. The old argument that a lower price for power is warranted as it gives the lighting plant something to do in the day time, has not now the same weight. The power load should stand its full share of capital and depreciation charges the same as the lighting load. The power supply, too, needs protection the same as the lighting supply; and therefore for it spare plant, put down with generous consideration for the factor of safety, is necessary. The justification for an exceptionally low average price for power against a comparatively high average price for lighting, recedes from the old argument the farther the business is carried. The lowness of the average price now obtained has led the managements of some concerns to increase their prices so as to avert the peril of a continuously falling average price, under circumstances that will not allow it to go in, unless there is eventual financial disaster—more especially with the prospect of permanently higher prices for coal and oil.

Electric Meters and Undercharges.

A fortnight ago we referred to a case in which something looking like a decimal point on an electric meter dial had caused the misreading of the registration, and had let the electricity consumer in for a heavy account for arrears. The St. Pancras Electricity Department have discovered that the

Railway Clearing House has also been undercharged through an error in connection with meter readings, which error has caused an account for arrears in their case of £747. It came about in this way. In 1907, the voltage of the supply was changed from 110 to 220. At the Railway Clearing House, three of four 110-volt meters were replaced by 220-volt meters. The fourth 110-volt meter was allowed to remain, inasmuch as it was of special size and cost; and the meter-reading book was marked to be subject to a multiplying constant of 2 in making out the account. The constant was subsequently omitted from the meter-book; and the result is that the multiplier has not been used, and so only half the value of the current has been charged for. The Railway Clearing House authorities have been very nice over the matter, and have paid in full. In another case a 220-volt meter was found in use, connected to a 440-volt supply. This was responsible for an undercharge of £41, which has also been paid.

Lamps as Fixtures. A case of general interest has recently been decided, which has placed electric lamps in the category of "fixtures." The Empire (Mile End), Limited, and A. Bernstein were defendants; and they claimed that the lamps in the theatre were all fixtures. The plaintiffs in the matter were the British Economical Lamp Company, Limited; and, the lamps having been let on hire by them, they contended that they were not fixtures. The City Recorder (Sir Forrest Fulton) held that they were fixtures. Justices Lawrence and Lush have, on appeal, upheld this decision. The facts are these: The action was brought to recover the electric lamps (or their value), as well as damages for their detention. The owners of the theatre re-entered for non-payment of rent, and had been in possession a month or more before plaintiffs made their claim. The lamps were affixed to the brackets by the ordinary bayonet attachment. Plaintiffs let the lamps on hire to the late tenants of the theatre. Their Lordships said they had to consider if plaintiffs had shown a cause of action; and in their opinion they had not done so. They claimed the right to enter the theatre and remove the lamps; but they had their remedy against the person to whom they let the lamps. The lamps were affixed to the brackets; and their Lordships knew of no duty on the part of defendants to disconnect them, and return them to the plaintiffs. People with lamps on hire who are not specially protected will consider their position in relation to this decision.

Miscellany. The Notting Hill Electric Lighting Company, of which Sir William Crookes is Chairman, is the first electric supply company to adopt co-partnership. At the annual meeting of the British Engine, Boiler, and Electrical Insurance Company, Limited, the Chairman (Mr. R. C. Longridge) mentioned, in regard to electric-motors and other machines, that, while the amount paid in claims during the year was about the same as the year before, the ratio of breakdowns also remained nearly constant—viz., one out of every nine machines insured. In his annual report, the Coroner for the City of London (Dr. F. J. Waldo) states that of 180 fires reported, in only 25 does the cause remain unknown. In the case of fifteen fires, he has, with the expert assistance of the Corporation Electrical Engineer, been able to decide that these fires were due to defective electrical arrangements. In the case of gas, nine fires were caused through the ignition of escapes, and four were occasioned by gas-stoves. The Waste Heat and Gas Electrical Generating Stations (which venture has been a success since its commercial start) take waste gas from coke-oven plants and ironworks, convert it direct into electrical energy, and supply it to electricity distributing authorities. During the coal strike last year the operations of the Waste Heat Company were forcibly stopped. It was a good thing their customers had generating plant sufficient to provide during that period all the energy they required. The shareholders of Metalite Limited, whose meretricious advertisements attracted our attention when the Company was floated, have held their adjourned second annual meeting; and it has been further adjourned. The Chairman stated that a Receiver was in charge, a few lamps are in stock, but the Company are not at present making any. The Board are hoping to get more money, and to strengthen the directorate. The St. Pancras Borough Council have entered into an agreement with the London Housing Society for a supply of current to its residences in Judd Street for lighting, heating, and "cooking" purposes upon payment by the Society direct of an annual charge in advance of £11 per kw. and ½d. per unit for all current supplied by meter. This is upon the condition that *no gas is used by the Society in any of the buildings*. Who gave the Borough Council the right to make a stipulation of this kind? and why are they so afraid of gas as to make it?

The next meeting of the Eastern Counties Gas Managers' Association will be held in the Lecture Room at the University Chemical Laboratory, Pembroke Street, Cambridge, on Thursday, the 24th inst. Papers will be read by Mr. T. Goulden, of London, and Mr. W. Orme, of Woodbridge.

The annual general meeting of the Scottish Junior Gas Association (Western District) will be held next Saturday evening, in the Glasgow Technical College. The business will consist of the presentation of the report and financial statement, the election of office-bearers, and the delivery of an address by Mr. J. W. Napier, of Alloa.

GAS FOR THE LAUNDRY.

Amid a quantity of extraordinarily ingenious machinery devised for the accomplishment of what at one time was a simple operation performed by the washerwoman, one was pleased to find at the Agricultural Hall last week that attention was drawn to some of the uses of gas in the laundry. The occasion was the Exhibition of the Laundry Engineers and Allied Trades, Limited; and the gas lighting and heating apparatus firms who were represented were the High-Pressure Lighting and Heating Company, of Farringdon Road, E.C.; the James Keith and Blackman Company, of Farringdon Avenue, E.C.; and Messrs. James Stott and Co. (who exhibited their governors). Gas-ironing machines, &c., were shown by various firms; and Messrs. Davey, Paxman, and Co. had installed a gas-engine and suction plant.

The High-Pressure Lighting and Heating Company drew attention to the "Cook" compressor—a belt-driven, double-acting compressor, with a capacity up to 500 cubic feet per hour, in which the gas is compressed and automatically regulated by the friction drive of the compressor and the "Cook" patent valve. The friction drive is adjusted so that the correct pressure is maintained, and the valve is weighted to regulate the gas at this pressure. When gas is required at more than one pressure, the supplies at the different pressures are taken from separate valves, which are weighted accordingly. Simplicity and steadiness of pressure are claimed for the system; and another point is compactness. The compressor, it is remarked, takes up only a very small space, and weighs 60 lbs.; so that it can be placed on brackets on the wall, out of the way of dust and dirt, and under the eye of those in charge. Laundry and factory high-pressure lamps were on view, in various patterns; and there were also the improved "Cook" hand iron and the "Economic" gas-iron, ironing stoves, and machine burners, as well as high-pressure and low-pressure gas soldering irons. The patent "Matchless" automatic gas-ring bye-pass adaptor, exhibited by the same Company, is an arrangement which can be fitted to any gas-ring in a couple of minutes, with a resultant saving of time and gas. There is a lever, one end of which operates the gas supply cock while the other end passes to the centre of the ring; and along the lever runs a bye-pass tube. The arrangement is so adjusted that, when the lever is depressed by a vessel being placed on the ring, the main gas supply is turned on and ignited by the bye-pass; while on the vessel being removed, the lever automatically rises, and the gas supply to the ring is cut off. It is an inexpensive contrivance, which should prove useful for attaching to gas-rings which are frequently in and out of use.

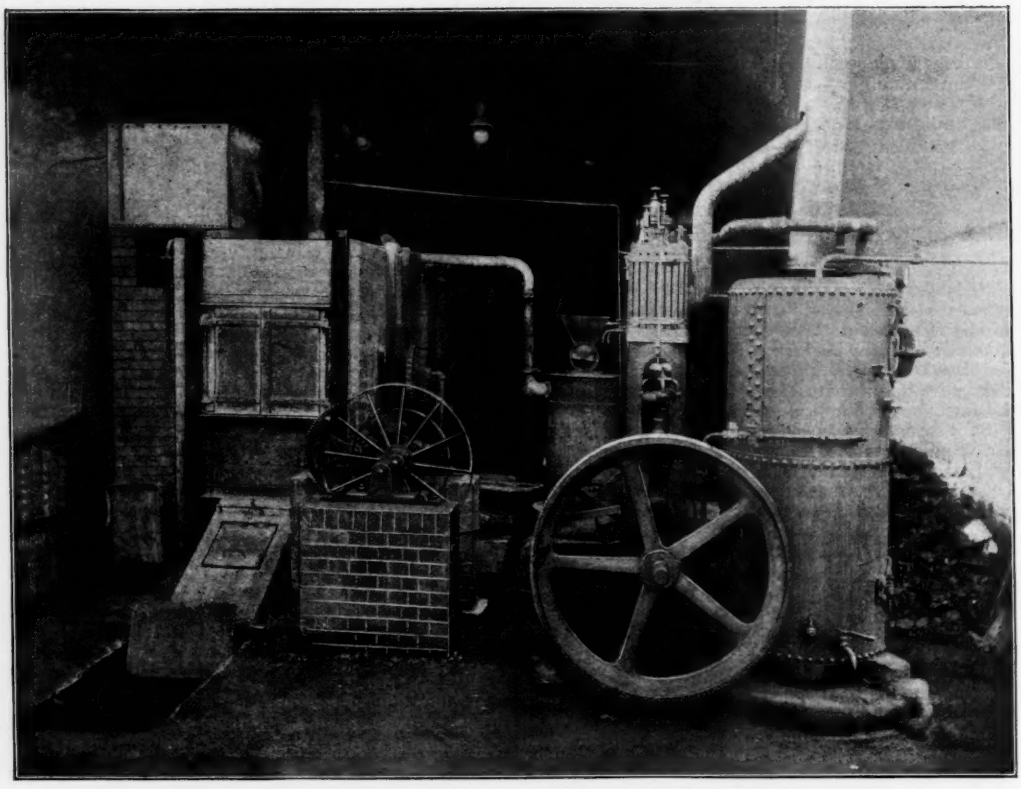
The stand of the James Keith and Blackman Company was fitted with a selection of their high-pressure lamps, provided with gas by the firm's well-known rotary compressor, direct coupled to an electric motor. The pressure of gas is increased by the compressor to about 80 inches water-column; one set of piping only being required to serve both lighting and heating apparatus, which are under perfect control. There was, among other irons, a collar ironing machine adapted for high-pressure gas; and examples of the No. 4 type of rotary compressor, without box base (which is more specially suited to industrial heating purposes, as distinct from lighting) were also drawn attention to, along with Keith textile fittings, which, it is pointed out, are used on a 10-inch pressure, and have the advantage that, if the power should fail, and the compressor be stopped, a reasonable light would be obtained from them on the ordinary low pressure.

There is plenty of opportunity for the use of gas in laundries, especially on the high-pressure system. In this connection, the following figures printed by the High-Pressure Lighting and Heating Company, as having been furnished by one of the largest laundry proprietors in London, are of interest: Gas consumed, June quarter, 1911, for 39 air-blast irons, five shirt and collar machines, and two small machines, not all in constant use, 115,000 cubic feet. Gas consumed, September quarter, 1912, by high-pressure gas-irons and machine burners on the Company's system, for 40 irons, five shirt and collar machines, and three small machines, all in constant use, to cope with an enormous increase of work, 104,000 cubic feet—the increase of work and decrease of gas consumption showing a saving of 25 per cent.

Gas Analysis Apparatus.—Herr P. Eyer has taken out a patent for Germany for apparatus for analyzing gas. According to an abstract of the specification in the "Journal of the Society of Chemical Industry," the apparatus consists essentially of a U-shaped tube one limb of which is provided with a graduated scale, below which is a stopcock of such construction that this limb can be either closed or put in communication with the atmosphere or with the other limb. There is also a two-way stopcock in the bend of the tube. A suitable absorption reagent is poured into the ungraduated limb of the tube until it reaches to the stopcock below the graduated scale; and this stopcock, after the one in the bend of the tube has been closed, is turned to communicate with the atmosphere. The gas to be tested is drawn through the graduated limb to displace the air, and then a definite volume of it is collected by closing the stopcock. The latter is then turned to bring the gas and absorption reagent into contact, and the apparatus is shaken for some time. On opening the stopcock in the bend of the tube, the absorption reagent rises in the graduated limb to an extent corresponding to the volume of gas absorbed.

THE RICHARDS LOW-TEMPERATURE CARBONIZATION SYSTEM.

For the Production of Smokeless Fuel and the Recovery of Bye-Products.



THE incentives to the development of a practicable low-temperature system of coal carbonization were never greater than to-day, with the work that is being incessantly prosecuted for realizing greater atmospheric purity by adopting either gaseous or smokeless solid fuel, and with the demands that have come from the motor car world for a motor spirit, such as benzol, that can enter into commercial competition with higher priced petrol. But the low-temperature systems that have so far obtained publicity, rather by the aid of skill in advertisement than by high merit of the systems from a technical standpoint, have not appealed to us. The technical deficiencies in the matter of design have been apparent, and those deficiencies have been proved either by troubles in working, or by disuniform quality of product working with the same coal. We need not particularly specify the systems that we have in mind. The more important thing is to ascertain whether, as they come along, other systems present greater promise; and if, within the limits of the available experience, they commend themselves, then it is our duty to say so.

THE PRIMARY PRODUCT AND UNIFORM QUALITY.

In these low-temperature carbonization processes, the primary product must be the smokeless solid fuel; and that fuel must be in any district of a quality that is fairly uniform, or, if the quality varies, there must be varying prices. But it is no use attempting to build up a business among the public on a new smokeless fuel that purports to contain sufficient volatile matter to cause it to be flammable, if the volatile matter in the material has a range of variation extending from (say) 17 per cent. to 2·46 per cent., which low figure renders it no better for household purposes than gas-works coke. To offer to the public a material that is no better than ordinary gas coke as something possessing higher qualitative value, is sheer imposture; and the public are not going to be satisfied with such a condition as that. It would, in short, be pure speculative folly to expend money on a system that produces a fuel from one class of coal of such widely varying quality; for this merely indicates that the system as a workable, practicable one, is seriously at fault. There are two things that have been particularly shown by the systems of low-temperature carbonization that have come before us; and they are that it is no use trying to carbonize at low temperatures strongly caking coals in small diameter tubular vertical retorts, owing to the trouble experienced in discharging and clearing the retorts, and secondly it is no use attempting to carbonize at low temperatures in large circular vertical retorts in the expectation that a smokeless fuel uniform in its percentage of volatile matter will be obtained, because there will be disappointment. The Del Monte trial plant, and the investigation of the system by Mr. W. J. A. Butterfield, have proved that. For the production of a smokeless fuel of uniform quality, the coal must be carbonized, at low temperature, in a manner that will expose it throughout to an equal temperature and during the same period. This can only be done by carbonizing in small quantities or in thin charges; and even then it will all depend upon the design of the carbonizing plant whether this can be done, with all classes of coal, without incurring the troubles that have been experienced in the working of certain systems. Beyond carbonizing in small quantities or thin charges, the total bulk of a charge must not be small, or at once uneconomical working comes in as a factor of no small adverse character. There has been an immense waste of money through not understanding the primary essentials in such systems.

The object of designing so that all parts of a charge are exposed simultaneously to the same temperature, and for the same length of time, is to secure the uniform primary product to which reference has been made. The problem, *primâ facie*, seems a difficult one; but when one sees that it is being done it shows itself to be a matter of comparative simplicity, and free from the complex conditions of working that have been found in predecessors. We have seen such a system, and inspected its working so far as the first and more important part of the process is concerned. It is a system which can carbonize any class of coal at low temperature without meeting with any of the carbonizing working troubles experienced in other systems hitherto introduced to notice, and at the same time it can and does give a uniform quality of smokeless fuel. It is the patented invention of Mr. R. S. Richards, who has been all his life interested in the coal industry, and who is associated with Messrs. John Chapman and Co., of 101, Leadenhall Street, E.C. Mr. Richards therefore knows how widely varied is the composition of coals, and how vital it is, in order to treat by low temperatures different coals for the purpose in view, that the system of working must be of a flexible character.

DESCRIPTION OF THE PLANT AND SYSTEM OF WORKING.

The small trial plant upon which Mr. Richards has been working during the past three years is situated at Bermondsey; and we reproduce a photographic illustration of it. It should be explained in connection with this photograph that the vertical steam boiler and engine in use for driving purposes, as well as the small gas-producer in the rear of the driving plant, are only of a make-shift character; but, if anything, they accentuate the modesty of the whole plant, which is an important consideration in connection with the work of coal carbonization. There is one other point. Small ascension-pipes will be noticed at the top of the setting; but these (except for the dispersion of the gases) are not in use, as Mr. Richards has up to the present been confining himself to the primary fuel, and paying no attention to the secondary products, which will be recovered in working on ordinary lines.

The structural features of the plant as also the system of

carbonizing are so interwoven that it will facilitate description by dealing with them at the same time. The system of working is a continuous one—continuous charge and discharge. The external character of the trial plant shows a plain solid structure. Internally there is a chamber heated at the bottom and sides by gaseous firing, and a special arrangement of flues. The working temperature is about 900° Fahr., as was seen by a pyrometer that was available. In this chamber, there is a continuous tray conveyor, the return chain of which passes through a channel beneath the chamber, and so is not kept constantly at the coal-carbonizing temperature. On the side of the setting (as may be seen in the photograph) is the driving-wheel, which is geared-up to the vertical steam-engine. But all this plant and the gas producer in a permanent installation will be cleared away, as it is the intention of Mr. Richards to utilize the gas he produces (after treatment, to recover from it the ammonia and benzol) for heating the settings, in gas-engines for driving purposes, and for supplying the heat and power required in the bye-product processes so far as they are worked.

However, returning to the trial plant, the distance between the two axles (which, by the way, are water-cooled) driving the tray conveyor, is about 12 feet; and as the time taken by the coal to travel from the point of its entry to the chamber at one end to the point of its ejection at the other end is two-and-a-half hours, the motion of the driving-wheel is almost imperceptible. It will be apparent from this that the wear and tear on the mechanical arrangements is of the slightest. The same with the chain and trays. Although these have been working about three years—true intermittently—there is very little visible indication of wear. An important feature of the system is the tray conveyor. It is the working part that plays the important *rôle* of enabling continuous working, with little manual labour or attention; of allowing considerable charges of coal to be dealt with in twenty-four hours; and yet (maintaining, by gaseous firing, equal temperatures) exposing all parts of the coal to those temperatures, in order to obtain uniform quality in regard to volatile matter from a given coal. The coal feed is by gravity from an elevated hopper at one end of the setting. The coal first passes from the hopper to a drum of some half-a-dozen compartments; the number being variable to suit the circumstances. From this drum, the coal is delivered to the tray conveyor. The trays in the trial plant are 15 inches wide, 5 inches deep by 8 inches across, including 1 inch for overlapping, and they can be made any width one likes, according to the size and capacity of the installation. The trays are divided in their width by several partitions, or (as Mr. Richards calls them) "radiators," open-ended lengthwise of the carbonizing chamber. These radiators and the trays become highly heated—within the limits of the chamber temperature; and to these radiators Mr. Richards gives credit for the uniformity of the carbonization, and therefore of the quality of the resultant fuel, and for his ability to deal with caking and non-caking coals at will. The distance between the radiators is 2½ inches, so that the centre of each small pocket of coal is not more than 1¼ inches from the heat-transmitting radiators. The narrowness of the pockets formed by the radiators necessitates the use of coal dust or crushed coal. But more on this point presently. In this trial plant, the capacity of the length of conveyor in the carbonization chamber is 150 lbs.; and after this has had its two-and-a-half hours' passage through the chamber, the weight of smokeless fuel delivered is about 68 to 80 lbs. per 100 lbs. of coal—the average of a large number of different coals that have been tested being about 71 lbs. per 100 lbs. The discharge is by automatic means through a shoot delivering into a hopper, from which the fuel is removed by hand, or probably henceforth mechanically in the case of large installations. At the charging and discharging end of the chamber, the arrangements are such as to secure practically air-tight conditions; and assurance will be made in the ordinary working plants that complete tightness is obtained. At the charging end, the coal-feed arrangements prevent access of air; at the other end there is what Mr. Richards terms a "lock" formed by a couple of doors. Double doors are also provided with cemented joints, for the purpose of readily gaining access to the carbonizing chamber when necessary.

The unit of plant that Mr. Richards is proposing for the future will be equal to treating 35 tons of coal per twenty-four hours, and such a setting complete, he calculates, will cost about £1000—perhaps rather under. He hopes before long to be in a position to put up such a plant, and to have it in regular operation. When he has such a unit at work, then he will be able to collect and thoroughly test the question of the production of secondary products.

It will be remarked as far as the carbonizing operations are concerned that, with an automatically continuous system such as this, the amount of labour is comparatively small. We should imagine that one man would be quite capable of looking after three or four units per shift.

The Coal and the Staple Product.

With this trial plant at Bermondsey, coals—caking and non-caking—have been tried from many collieries situated in different coal-fields; and the plant has been found to be as much at home in carbonizing one class of coal as another, owing to the flexibility of the method of working. With the charges divisioned as they are here, and undergoing gradual carbonization during the slow travel through a heating chamber of ample dimensions, a coal that intumesces has not caused—in fact cannot cause—any more trouble than the worst non-caking coal. The day of our recent visit, both a caking and a non-caking coal were being treated; and during the week the plant was dealing with a West Riding silkstone from the Normanton colliery of Messrs. Pope and Pearson, with coal from Annesley Colliery near Nottingham, and with coals from the Clifton and Exhall Collieries. There is one thing that is insisted upon, and that is that the coal shall be washed, as Mr. Richards is desirous that, for the smokeless fuel produced by the system, as low a standard of ash as is possible shall be established. Of course, in the case of coal known to be particularly clean, washing will not be insisted upon. But most collieries wash the coal now, as it is obvious that if there is 10 to 15 per cent. of ash washed out there is less to carry, and less to pay for transport.

The idea is that the system shall be first utilized for treating coal dust as produced at the collieries, as this can be obtained at a cheap rate (and, in fact, collieries can, under licence, adopt the plant to profitably work up the dust produced by them); but where the plant is applied, and dust is not procurable (as, of course, the supply of coal dust is limited), then larger coal will have to be obtained. There is a plentiful supply of through and small; and although the cost would be higher than the dust, there would be some increase in at any rate the secondary products. If larger coal still had to be purchased, it would have to be crushed (as is the case under the present carbonizing conditions in gas-works), in order to be made serviceable for the partitioned trays in the Richards process. But this crushing is not a costly matter to-day; and, in fact, as it would not be necessary to use screened coal, the saving in this respect would go towards the cost of reducing the size of the coal.

Now, with bituminous coal, the effect of carbonizing in the small compartments formed by the radiators is that the smokeless fuel comes out in blocks some 2½ inches thick, and looks very much like the ordinary shop briquettes to which we have been long accustomed. According to the quality of the coal, the fuel contains from 12 to 15 per cent. of volatile matter, and the percentage is uniform throughout any run of the same class of coal—temperature and carbonizing time being constants. With caking coal, there is only about 5 to 8 per cent. of breeze formed; and this is treated in precisely the same way as is the material obtained from the non-caking coals. The non-caking coal, after treatment in the process, is discharged only as breeze. But it contains a good percentage of volatile matter; and it is utilized for making smokeless fuel "eggettes" for domestic purposes, or for suction-gas plants. The manner of doing this is by mixing the breeze with about 8 per cent. of tar; and then forming the "eggettes." These are again passed through the carbonizing chamber; the bulk of the tar being thus recovered, and small homogeneous smokeless "eggettes" the result. It is a system in which it is proposed that nothing whatever shall be wasted, and shall be fully self-contained in the matter of materials required, save the raw coal and the sulphuric acid or other necessaries to the working-up of the secondary products.

Touching this matter of briquette making, Mr. Richards has been instituting some inquiry as to the question of cancer among pitch workers; and he is informed that a safeguard is the use of baths after the men have finished work. But though baths are provided, the men, as a rule, appear loth to use them. In the case of his process, in the making of briquettes, tar only is used; and he learns that there will be no harm to the workers with this. That is evident from the long use there has been of gas-works tar. He also understands that it is believed that certain coals produce pitch which may give rise to cancer, while other coals do not; and experiments are being made to determine this.

The Question of the Secondary Products.

It has already been seen that the work connected with the system has been confined exclusively to carbonization, and the primary product—smokeless fuel. No attempt has been made to collect the residual gas and other products. They have been all dissipated; and work in that direction is left for a larger and more permanent installation. Mr. Richards, in point of fact, does not regard this as a matter of importance until commercial work actually starts—his contention being that with any system of carbonization, at a given temperature with a given coal, the quantity of secondary products will be the same; with a different temperature there will be a variation, as well as with different coal. Other factors, however, do come into play—such as the degradation that may arise by contact of the volatile and liquid products with heated surfaces. Mr. Richards' system may vary in this respect from other systems. *Primâ facie*, however, we should imagine that it would, when the system of collection has been developed in a permanent plant, give a better account of itself than some other systems which we have in mind. There would be little service under the circumstances in constructing or giving circulation to any hypothetical statement in this regard as to production and financial result. One can only make estimates from known data as to productions, at low temperatures, derived from other low-temperature systems. However, it is proposed to deal with the system of bye-products much the same as in any other system; and, Mr. Richards being a progressive man, as he meets with success in one direction, we can foretell an expansion of his ideas as to what shall form a permanent accompaniment of the process. In connection with a large central plant or a large plant at collieries, he would advise that the tar oils should be fractionized, and the process carried out *in situ* to its fullest profitable limits. But in connection with smaller central plants or at the smaller

collieries, he would advise that operations should only be carried out, as on the majority of gas-works, to the point where highly skilled supervision is not required. He would, under such circumstances, advise that the gas be treated for the recovery of the ammonia and the recovery of benzol, and that sulphate of ammonia should be produced, but the cracking of the tar oils and the realizing of a larger quantity of motor spirit he would leave to the tar distillers. Where, however, the process can be carried out to the full extent, he anticipates that, according to the quality of the coal, about 2 gallons of motor spirit would be recoverable from the gas per ton of coal carbonized; and from the 17 to 23 gallons of tar oils produced, a further 3 to 4 gallons of motor spirit. The production of sulphate of ammonia he estimates at about 14 to 17 lbs. per ton with low-temperature carbonization, so that it will be recognized he is not pitching his claims too high.

In Conclusion.

The trial plant works clean, and without noise, and is compact for the quantity of work of which it is capable. There is no strain anywhere on the structure. The whole commercial success of such a system, of course, depends on the extent of the demand of the public for a smokeless fuel of the kind, at a price commensurate with its combustible and heating characters. That is the crucial point with a system that will produce a fuel of uniform character at low temperatures from a given coal. The secondary products are certain of sale at the market prices of the times. We anticipate that more will be heard of the system.

AN ORNAMENTAL GAS-LAMP.

In last week's issue, there appeared an article on semi-indirect gas lighting, with illustrations from the productions of Messrs. William Sugg and Co., Limited. Dealing expressly in that article with a development of lighting that promises to become highly popular, reference was postponed to a new form of lamp, adaptable to practically any interior position, save such places as factories, where its ornate appearance would cause it to be incompatible with the surroundings. Among inverted lamps that have grown in favour lately have been those types that have a porcelain or similar head, which can be easily cleaned, and kept free from the eyesore deposit which is noticed on neglected lamps with metal heads.

The lamp shown in the accompanying illustration, and which has been designed by Messrs. Sugg, is constructed with a Doulton ware case, with, in the present range of lamps, a light green ground and floral decoration. The lamp is made in sizes to take one, two, or three No. 4 mantles or the intermediate, or a larger, size mantle may be arranged for if desired. The lamp inspected by us (which is typical of all the others) is that known as No. 1643, which is a three-burner one. There is no visible part of this fitting that can become discoloured by contact of the products of combustion with the metal work. Below the Doulton ware casing, there is a shade, which can either be (as preferred) of a curved shape, or flat. This shade, again, lends itself to being fitted with a deep beaded fringe, or coloured silk shade. The lamp is therefore adaptable for any position—drawing-room, dining-room, restaurant, club room—in fact, the positions where it would not be suitable in one or other style are much fewer in number than the places where it can be installed with the utmost advantage and certainly with pleasing effect.

One of the structural features is the ease with which one can get at the burner or burners. Each burner plays its own part. At the side of the body, one finds a small union nut. By unscrewing this, the vital parts of the burner—gas regulator, air adjuster, and mixing chamber—can all be removed, cleaned, and restored to position in less time than it takes us to tell of the point. To do this, one does not have to touch any other part of the lamp; so this is a structural feature which subscribes to the ready and proper maintenance of the lamps. Each burner has its separate gas and air regulator. Inside the body of the lamp, it is found that—in the multiple-burner forms—the burners connect up to a cast-iron superheater common to all, though each burner is under separate control. This does away with the trouble sometimes experienced with single superheaters, of one burner receiving a larger supply of the gas-and-air mixture than its fellows. In this case there is the even distribution necessary for high and uniform efficiency; and this is obtained by the ability to individually regulate the burners. A mantle globe is used; but that, of course, is a matter of choice. The shade and the globe are suspended on an enamelled steel supporter, which is held up by a bayonet joint; but no disaster can befal this or the shade and globe through accidental dislodgment, as the support is locked in position by a small spring catch, which prevents it turning round. To remove the supporter, one has to pull out the spring catch, and then turn the former round, before it can be taken down. The inside globe is carried on the supporter by means of three screws; and the shade is accommodated on the outer rim of the supporter—the heads of the globe-screws keeping the shade in position. The new lamp is fitted with a lever cock and chain, or it can be equipped with an automatic lighter of any preferred type. The lamp we examined had a "Switch-on" lighter attached; and it was doing the work of demonstration with the greatest efficiency. The illustration of the lamp tells the rest of the tale.

ARTIFICIAL RUBBER FROM COKE-OVEN GAS.

The "Bulletin" of the French Society of Civil Engineers for December contained a paper on "Coke-Oven Gases and their Utilization," by M. Gouvy. In the course of it, he refers to a new application of coke-oven gas which he considers should be mentioned on account of its originality—viz., the manufacture of artificial rubber. Samples of this product were shown at the stand of the Tar-Utilization Company, of Duisburg, at the Düsseldorf Exhibition last year. M. Gouvy points out that after prolonged investigations conducted by various chemists, including Hoffmann, with the object of finding a substitute for india-rubber, it was produced synthetically by the processes patented by Herrn Bayer and Co., of Elberfeld, which were based upon the manufacture of butadeine. More recent researches, however, have shown that rubber consists mainly of a hydrogen carbide, most complex in composition—viz., isoprene—the simplest form of which is butadeine. The labours of Harries having demonstrated that this exists in small quantities in the crude gases of coke-ovens, the above-named Company based their process upon its polymerization into isoprene—*i.e.*, rubber.

The raw material is really extracted from coke-ovens by a special treatment of benzol, which distils below 25° C. As the claims attached to the German patent only furnish a general description of the process, M. Gouvy gives a working example extracted from the specifications. The crude benzol is subjected to fractional distillation at a temperature in the worm of — 10° C. until the fumes mark a temperature of 25° C. Then 100 parts of the distilled product are left in contact with two parts of sodium, in the form of threads or sheets, exposed to atmospheric temperature. In a short time the acetylene hydrocarbons of the sodic compounds are precipitated in the form of a white and brownish-yellow powder, which readily deposits, and polymerization of the other hydrogen compounds immediately begins—finally transforming the contents of the vessel into a gelatinous mass. When this has attained a maximum consistency, it is diluted with benzol, and the sodic compounds are removed by decantation or filtering; the rubber being precipitated from the benzol solution with alcohol. The presence of small quantities of ammonia accelerates polymerization.

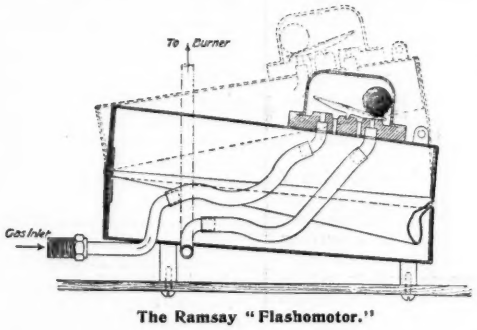
The manufacture of artificial rubber by the process described is still in the experimental stage, and the cost price must be very high. However, M. Gouvy thinks it should be less than in the Bayer process, which necessitates the previous manufacture of butadeine, whereas this substance already exists in the crude gases of coke-ovens. The samples examined by the author appeared to be perfect as regards solidity and elasticity. Consequently, the success of the process may eventually revolutionize the markets for natural rubber.

Pintsch High-Pressure Lighting for Railway Yards.—The Glasgow branch of the Invicta Gas Lighting Company (Pintsch Light) have secured the contract for the complete installation of high-pressure lighting in their South Leith and Portobello yards for the North British Railway Company. When completed, this will, we are informed, be the largest installation of the kind carried out for any railway company. There will be altogether 100 high-pressure lamps of about 1000-candle power; and two compressors will be employed, each capable of dealing with 2400 cubic feet of gas per hour, and of giving illumination equal to 65,000-candle power. The contract was secured by the Company's Engineer, Mr. Edward Riach, who is their representative; a condition being that he is to give his personal attention to the work until its completion.

SIMPLE AND EFFECTIVE GAS FLASH-SIGNS.

It may fairly be said, without disrespect to the magnificent street lighting effects obtained by means of inverted incandescent gas-burners, that a considerable portion of the brightness of many of the largely frequented thoroughfares nowadays is derived from illuminated advertising signs. It is a form of publicity which has grown rapidly in popularity, and will continue to grow. The eye is almost irresistibly attracted by it—and perhaps it would not be too much to affirm that the attraction is quite irresistible when the sign happens to be either a flashing or moving one. In the development to its present stage of the art of illuminated advertising, it must be admitted that electricity has had the greatest share; but there has never been any reason whatever why gas should not equal the best efforts of the electricians in this direction—and at a much smaller cost, both as regards initial outlay and running expenses. Thus there is still another big field open to the gas industry; and any means that will assist in its full cultivation should be assured of a warm welcome and sympathetic investigation of its merits. From time to time attention has been drawn in the "Journal" to different methods devised for utilizing gas as an advertising medium; and in view of the importance of the matter, it is to be hoped that suggestions will continue to be brought forward. So many people are desirous—indeed, find it vitally necessary—to advertise, that there ought to be plenty of room for all the efficient means that are likely to be devised for attracting the public, at the extremely modest expenditure that is entailed by a reasonable supply of gas.

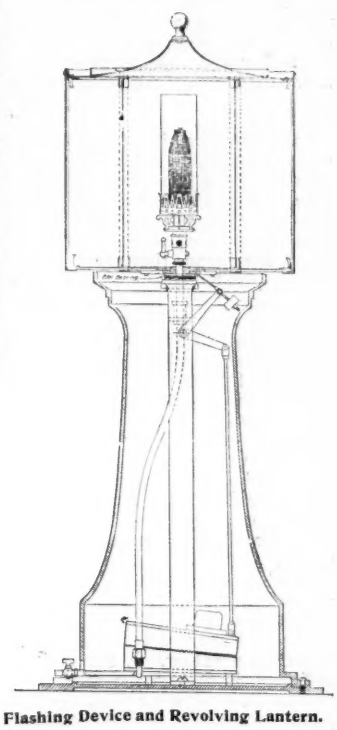
A purchaser of food and raiment who places inexpensiveness above all other considerations is seldom wise; but an advertiser who does so, never is. When, however, this advantage is combined with quality or effectiveness, the proposition becomes a sound one. The two points of cheapness and effectiveness are well combined in a system of illuminated gas flash-sign advertising, demonstrations of which the writer has witnessed at Nos. 59 and 60, Chancery Lane, W.C. The invention is covered by patents which are the property of the Ramsay Gas Flashomotor Company, Limited, of 19, Trundley's Road, Deptford, S.E.; and the basis of the whole thing is the "Flashomotor" itself—a small pair of bellows made of tin, with sides of rubber (or other material, if preferred). By means of this simple piece of apparatus, the gas itself, before being consumed, is made to operate the sign which it illuminates—no clockwork or anything of the kind being required. The expense of working is thus reduced to that of the gas actually burnt; and with incandescent burners this is, of course, much less than the expense of electric current would be, apart altogether from the question of operating mechanism.



The Ramsay "Flashomotor."

The illustration showing the bellows and the valve needs but little description, as the idea is in no sense a complicated one. It will be seen that the upper or moveable part of the bellows carries the control-valve. The valve is a see-saw body rocking about a knife-edge, and controlling at each end an orifice—one in connection with the gas-main, and the other with the burner. A ball runs on the valve, so that, as the upper part of the bellows in moving alters the inclination of the valve, the ball runs down the incline and tilts the valve, closing one orifice and opening the other. The valve-box communicates with the bellows by means of four small passages passing up through the valve seating. The gas-supply pipe and the pipe to the burner are rigidly fixed to the bellows, and are flexibly attached to the valve-seating by rubber tubes passing through the bellows. When the valve has shut off the supply to the burner (as indicated in the illustration), and the bellows are expanding under the pressure of the incoming gas, a small quantity of gas is still allowed to pass through a bye-pass orifice in the valve-seat, so as to keep the burner alight, pending the subsequent flash. The expansion of the bellows proceeds until the angle has been reached which causes the ball to run to the other end of the valve and cut off the supply of gas from the main, while at the same time opening the delivery to the burner. Contraction of the bellows under its own weight then follows, during which a full supply of gas is delivered to the burner, and the sign is lighted up. When the contraction has proceeded far enough to tilt the valve so as to move the ball again, the operation of cutting off the burner supply and opening the main pipe is once more accomplished. In this way, as has already been remarked, the gas, before being consumed, operates its own flash; and the periodicity of these flashes, it should be remarked, may be regulated by several means—that is, by slightly altering the valve, by adjusting the supply-cock, or by providing two balls in the valve-box instead of one. As to the durability of the bellows, there is on view one which is still working, and which it is stated has been in operation for about a couple of years; while, to quote another instance, the Hampton Court Gas Company have had one of the devices in use outside their show-rooms every night for sixteen months (with the exception of a short period during the height of summer), and have found it to work very satisfactorily. With the qualities of inexpensiveness and effectiveness the Ramsay "Flashomotor" may therefore be said to combine that of durability.

The apparatus is operated by gas at ordinary pressure; and it can be adapted to a practically endless variety of illuminated signs. The single flash has been explained; but by suitable additions to the valve apparatus, alternate flashes can be arranged, giving two distinct advertising effects. Then, again, as many as six of these double valves (giving twelve separate flashes) can be fitted on one bellows, and arranged in different positions, in such a way that the balls will always move at different moments. The smallest size bellows (6 or 7 inches long) is, it is stated, able to lift in expanding under ordinary conditions a weight of 2¼ lbs.; and the second illustration shows one way in which the power available has been utilized, in addition to providing for the flashes. In this case, the flashing device is combined with a single burner and a revolving lantern. The bellows are, it will be noticed, connected by a rod and bell-crank lever with a pivoted pawl, which is adapted to co-act with pins disposed in a circle round the bottom of the lantern (which revolves on ball-bearings), so that when the bellows are expanding, the force of the gas is utilized to turn the lantern round a sufficient distance to expose another side to each point of view—the movement thus taking place when the light is turned down. Another variation is an outdoor revolving sign, in which case the "Flashomotor" and the revolving apparatus are contained in the base of the lantern; the space occupied being so small as to be hardly noticeable. In fact, there is on view a revolving lantern weighing, with the heavy glass panels, over 30 lbs., and fitted with three burners, which is operated by a bellows measuring 7½ by 8½ inches, contained in a box at the base only 6½ inches deep. It may be mentioned here that, though inverted burners are utilized in the demonstration signs, it is intended in future to fit upright incandescent burners.



Flashing Device and Revolving Lantern.

Yet another development of the "Flashomotor"—for spelling words, &c.—is the multiple effect device, which provides lights and flashes simultaneously, alternately, or in any order that may be desired. This is employed where anything over a dozen changes are required; and by means of a cylinder measuring 3 by 4 inches, as many as 96 lights can be worked in the order desired. No more pressure in working is required; and for every quarter inch increase in the height of the cylinder, without any corresponding increase in the diameter, eight additional lights can be put on. No power beyond the "Flashomotor" is needed. In the first place, the bellows are used to operate a simple flash-light, so as to utilize the exhaust gas for illuminating purposes; and then the power of the motor works a distributing valve. This valve is composed of a number of interchangeable distributing rings, with orifices which act with ports in the side of a surrounding cylinder—each port communicating by a pipe with a burner. Different coloured globes are fitted to the burners, so that any sequence of burner and colour can be secured by the arrangement of orifices in the rings. The rings can be altered so as to make all imaginable changes in the lighting.

Some beautiful effects have been obtained with the signs—the illumination and colouring leaving nothing to be desired; while the endless variety of combination and movement that can be secured by this simple gas-operated system is a point that should recommend it to advertisers. The small revolving signs, particularly, would be an attraction on any shop-counter; and wherever there is a gas-pipe, the whole thing can be fitted up and at work in less than an hour. Besides appealing thus to advertisers, this "all gas" system should appeal to the gas industry to give it a trial.

BOILER PLANT IN GAS-WORKS.

By a Works Engineer.

There exists to-day in gas-works a great deal that is out-of-date in boiler plant. This is particularly important, as so many of the modern ideas not only bring economy in their train, but are also valuable in the prevention of accidents. Every engineer is fully alive to the great importance of eliminating accidents—in fact, a man has no right to call himself an engineer if he does not possess an absolutely adequate knowledge of the best methods of accident prevention. A certain section of gas engineers are not interested in this department of their works; for witness the often-expressed sentiment, "Oh! we burn rubbish in our boilers—a few tons more or less does not matter." If it stopped there, it would not matter; but in saying this they also as often as not dismiss the opportunity of rendering their boiler plant safer and more fool-proof.

The cost of supplying steam for gas-works is frequently expensive both in initial outlay and in working. Hydraulic installations, water-gas plants, exhauster engines, and pumps, often necessitate the provision of a large boiler plant. General efficiency not only saves money, but, as expressed above, saves accidents. In this article the writer will attempt to deal with some of the directions in which economy and general efficiency may be gained.

Fuel.

In the matter of fuel, no one should be content to sell breeze and burn coke, for it is much more economical to use the former as fuel. Coke breeze is of the same composition as coke. It may contain a little more water, but its percentage of combustible matter is identical with coke. Some boilers are fitted with grates that are not adapted for burning finely-graded fuel. Should this be so, the sooner they are fitted with suitable grates and forced draught the better for reasons of economy. The writer has had experience of Wilton's, Lee Howl's, and Meldrum's forced draught furnaces; and they, and some others as well, are quite efficient for burning breeze. There is no doubt that steam can be raised much more cheaply on breeze than on coke, which is too large to be properly consumed in a 6-inch or 9-inch layer of fuel, such as is used in a boiler furnace. The spaces between the lumps of coke allow the air to find its way through the fuel without being converted into carbonic acid. If coke is to be used, it is a good plan to mix it with an equal quantity of fine breeze, which will fill the void left by the coke. If coke has to be burnt separately, it is advisable to use natural draught, as for the above-mentioned reason the air rushes through the coke unconverted. Anything, therefore, that increases the velocity of the air makes matters worse.

Pan breeze should be screened, and the largest, from the size of a walnut and upwards, should be hand-picked, preferably by lads, as at this work they can do more than a man and at half the cost. It does not pay to attempt to hand-pick pan breeze of a smaller size than a walnut. A better plan, where the quantity made is sufficient, is to install a mechanical pan breeze washer, which will do the work splendidly, and produce from the furnace refuse 30 or 40 per cent. of excellent fuel for use or for sale. In this question there is one point to be borne in mind, and that is to ensure first that the machine is going to pay for itself. If the quantity to be dealt with is insufficient, it is quite certain it will not, as interest, depreciation, and wear and tear will absorb at least 15 per cent. per annum on the initial outlay, which may possibly amount to as much money as would keep a couple of men at work the whole year round. In addition, there is the labour required in attendance on the machine, feeding the machine, and in the removal of the washed and graded materials. There is no doubt that for works of a certain size it is a paying proposition. But there is a limit.

The writer has seen four boilers fed entirely on small pan breeze screenings of the size of nuts. In this case the boiler capacity was ample for the work to be done; natural draught was used; and the steam pressure was 45 lbs. per square inch. It was only these factors which rendered possible the use of so poor a fuel. If this class of fuel be driven, it speedily clinkers-up into a solid mass and needs continual replenishing. Even then it is impossible to keep steam. It must be borne in mind that pan breeze screenings—$\frac{1}{2}$ inch to $\frac{3}{4}$ inch in size—contain about 40 per of clinker, while even the 60 per cent. of coke remaining is half-burnt and soaked with water. So that such fuel contains not more than about 35 per cent. of combustible matter. To consume such poor fuel, it is necessary to maintain a low temperature in the grate and burn the combustible matter to ash and not clinker.

Efficiency.

In searching for efficiency, one of the first steps is to ensure that the exhaust steam is thoroughly utilized. In the writer's experience, the best method of doing this is to collect the whole of the exhaust steam into one common pipe, pass it through an efficient type of oil separator, then bubble it direct into the feed-water tank through a number of small pipes. Having boiled-up the feed-water by this means, the surplus steam should be passed through a condenser, which will provide a large quantity of pure water for the boilers. By this means a large quantity of the feed-water will be returned to the boilers in a perfectly pure state at a boiling temperature. The amount of fresh water required will be thereby reduced to a minimum, and very little scale will be deposited in the boilers. Should any chemicals be added to the feed-water for softening purposes, it is best to use them in the feed-tank and allow the water to flow through one or more settling tanks before being pumped into the boilers. By this means the sediment will be deposited outside the boilers, where it can be removed at any time. In large boiler plants, it is usually a paying proposition to instal economizers, whereby the waste heat is utilized for raising the feed-water to some 300° Fahr., or nearly the temperature of the boiler. It is in any case a good plan to cause the feed-water pipe to project into the boiler about two-thirds of the total length, so that the water may be heated to nearly the full temperature of the boiler. This pipe should be of copper, and supported by slings or brackets inside the boiler, but should be put in from the outside and fastened to the boiler by an external flange, sandwiched between the front plate and the flange of the feed check valve. It is then not necessary to go inside the boiler to remove it when choked up. It is further an advantage that the pipe is removable while the boiler is hot, and may be replaced at the same time by a duplicate. By this means a Sunday stoppage is long enough to see the job through.

It should be unnecessary to state that all boilers and steam-pipes should be lagged. The flues should be accessible, and have flue doors for cleaning purposes; and the brickwork should be pointed at regular intervals. The use of an anti-priming pipe is desirable, as being simple in construction. It is inexpensive, and tends to keep dry the steam issuing from the boiler. It consists merely of a pipe of a few feet in length placed horizontally in the boiler immediately under the steam outlet pipe to which it is attached. The anti-priming pipe contains a number of slots on its top side, equal in area to about $1\frac{1}{4}$ times the size of the steam-pipe. Steam traps should be fixed at convenient points along the steam-pipes, as nothing conduces to the production of wet steam so much as the presence of water in the steam-pipes. Steam-pipes should invariably be laid with a fall to the engines, to save the risk of damage from water hammer, as, if laid in the reverse direction and a steam-valve be opened on an engine, any water contained in the pipe will be driven with full force into the valve-chamber of the engine. In long lengths of steam-pipe there should be placed at intervals expansion bends or joints; otherwise leaky joints will be of frequent occurrence. In the same way the brackets or hangers supporting the steam-pipe should allow plenty of latitude for expansion and contraction.

Devices for Safety in Working of Boilers.

The details which follow are largely concerned with the greater safety in working of boilers. Fusible plugs are obviously indispensable, and no engineer would nowadays be without them. Low water alarms are useful and desirable, as it is impossible to ensure that a boiler attendant will not meet with some accident, have a fit, or become intoxicated while at work. Better still is the provision of feed-water regulators on each boiler, whereby the water-level is automatically maintained at any predetermined level, with a variation of not more than $\frac{1}{4}$ inch. By this means the water-level is controlled independently of the stoker. The writer has three boilers fitted with these regulators, and considers that, apart from the undoubted economy in fuel consumption effected by their use, their installation is justified for reasons of safety alone. Added to this, a steady water-level is one of the chief factors in the production of dry steam. The writer was induced to adopt this device owing to a boiler fireman being found asleep while the water-level in the boilers under his charge was 6 inches lower than usual. This apparatus may be installed at a cost of about £20 per boiler; and it is an expenditure which is soon recovered.

Cast-iron blow-off bends should be replaced by those of cast steel, which are infinitely stronger. This was impressed upon the writer by an accident of which he was a witness. A cast-iron bend fractured in a boiler under steam, with the result that the contents of the boiler were all emptied into the pit, into which the stoker fell in an effort to draw the fires. The blow-off pipe should further be connected to a copper bend or expansion joint to allow for sudden expansion when the blow-off cock is opened. Every blow-off cock should be fitted with that excellent device which locks the operating spanner in position when the cock is opened, so that with one spanner in use—an essential condition—it is not possible with a range of boilers to have more than one cock open at one time. The importance of this lies in the fact that with one boiler under repair, and with men inside at work, it would otherwise be possible for the blow-off cock to be open on this boiler as well as on a boiler under steam, with the inevitable result that the men would be scalded. The main steam-valve on a boiler under repair should be secured against accidental use by removing the operating wheel as soon as the valve is shut. This should always be the first job on shutting-down a boiler. The alternative in both the case of the blow-off cock and the steam-valve is to fit automatic isolating valves in both places. These are merely flap-valves allowing a passage in one direction only.

Protection glasses over the water-gauge glass tubes are absolute necessities; while the fitting of some device to render clearer the appearance of the water-level in the gauge glass is desirable. The best arrangement is one in which the water appears black in colour and the steam white. This makes the level absolutely distinct, leaving no room for doubt. Attention may be called to a fatal accident which happened some time ago at the East Greenwich Gas-Works, and to which the late Mr. Tysoe alluded in his Presidential Address to the Southern District Gas Asso-

ciation in 1903. The accident was due to the rapid corrosion of a blow-off pipe, owing to wet ashes dropping upon it, with the result that in the short period of two years a new pipe had rusted to such a degree that on the boiler blow-off cock being opened, the pipe burst—the man being scalded so severely that he died from the effects of his injuries.

Motive Power on Gas-Works.

Of recent years there has been an undoubted tendency to drive all additional plant either by gas-engines or electric motors—gas being in each case the primary motive power. Generally speaking, therefore, steam plants in gas-works are not likely to increase in size. This is as it should be; and, further, it should be the gas manager's policy to use gas, and not steam, engines. Gas-engines are now equally reliable, and with gas at works' cost (at which rate it should be calculated), there is no question that the gas-engine gives power at a much lower cost. Even if nothing but fine coke breeze and pan breeze is burnt under the boilers, the same reasoning applies, except perhaps in the few isolated cases where such fuel cannot be sold at anything like its intrinsic value. Where this is so, it is often the result of ignorance on the part of fuel users in the neighbourhood, and it only remains for the gas manager to demonstrate the value of breeze as a fuel.

In the meantime, while there are boilers in gas-works, they must receive the closest attention, pending the time when all motive power will be supplied by gas; any steam that is required being generated by the exhaust from the gas-engines, or by the waste gases from the retort-settings.

ENGINEERING EXPERIENCE.

By F. R. Parsons.

Individual experience might be compared to a seed sown in childhood, when aspiring youth for the first time becomes possessed of an overwhelming desire to make something. It may be only a desire to build a house with wooden cubes—this is the period of germination. Actual growth begins when the child receives an impression that his initial effort might be improved upon. His youthful mind already sees that he tried to build the house on an insecure foundation, or else that his bricks through not being laid squarely, or with sufficient care, caused the incompleted edifice to totter and fall. A higher mental stimulus has thereby been imparted, and with it a conviction that the second production must be built up on lines born out of failure. Thus careful observation of the things we have made, and the study of the functions performed by them, enable us to build up an experience which should grow richer and stronger as our life-work advances.

What is the principal stock-in-trade of an engineer? Experience. But do not imagine that by engineering experience is meant the sum of all that an engineer ought to know; for the lessons to be learned in the school of experience will come easier and quicker to the man who builds his experience on a broad foundation, extending deep into the accumulated experience of the profession. Now what is the quality termed experience as applied to a fully-cultivated individual? Is it not the formative or moulding effect which passing incidents and received impressions, relative to the work with which men's lives are identified, have upon the mind? And does not the mind become rich in experience in proportion to the concentration of the impressed thoughts from within, the strength of the impressions from without, and the store of impressions which the individual has gathered and arranged in his mental storehouse in such order as to be readily produced at the moment when their evidence is required to decide his course of action in regard to the subject to which these impressions relate?

When a plan or design for any engineering scheme is presented to an experienced engineer for his opinion as to its merits or practicability from an engineering or commercial standpoint, he at once recalls to his mental view a series of mind pictures which he has had stored away in readiness for such an emergency. These pictures now appear before him complete in every detail; his mind recalls the marginal notes placed there by experience, denoting their good points as they appealed to him, their bad ones as he found them, the amount of success, the number of failures attached thereto. He then contrasts the plan his eyes now see with that which his mind pictures; and if the former bears any resemblance to the latter in point of design, he is thereby enabled to at once form a shrewd opinion as to its practicability. This is experience. This is the quality in an engineer that commands the highest price in the engineering market.

Now it is obvious that there can be no royal road to success in this direction—experience is of too slow a growth to admit of this. Even when conditions are thought to be ripe for acquiring another parcel to store away in the mental granary, it will be found that what in conception has seemed so brilliantly promising, will, in practice, require considerable modification and rearranging before it is fit for storing. And especially is this true with experience gained in moving mechanism. An engine or a machine will make a most successful start, professional critics predict for it a most brilliant future, and the designer himself may feel wondrously elated over it. But by and by certain tendencies begin to manifest themselves, movements are not so positive, weaknesses obtrude themselves, inordinate wear in vital parts takes place, until, finally, these fatal tendencies having developed at an abnormal rate, the materialized thought of months, the hope of the designer, is ignominiously consigned to the scrap-heap. But would this be called wasted experience? Certainly not! Out of the dead ashes of failure will arise a new conception having its beginning where the other finished; its foundation stone well and truly laid upon the topmost pinnacle of its unfortunate predecessor.

Then there is another way of looking at this. No man can impart his experience to another, because no two men can see mentally the same viewpoint. What the writer means is this. An individual tries to achieve an object in a certain way, by means of certain ends. After a deal of trying, in which he meets with nothing but ill-success, he admits himself beaten and abandons his project. Straightway he tells the world that such and such a thing cannot be done, for the very good reason that he himself has failed to do it. In other words, he has made the mistake of measuring the universe by the capacity of his own brain. Then what next do we see? Another individual, unbiased and untrammelled with any previous failures in this direction, sets out to fulfil an object in a certain way. Instead of starting where his predecessor left off, and perhaps benefiting by another's failure, he draws on his own experience, works on original lines, and ultimately solves to the world's satisfaction the very problem on which the other's hopes had been so signally wrecked. Thus one experience contradicts the other. If number two individual had been guided by number one's experience, progress in that direction would have been at an end.

Yet again a man's own experience must be the result of wider observation than the limited horizon of his own efforts. If we cannot annex the experience of others, at least we can make a careful study of their systems and methods. We can test our observations by what is done by others, by our experience of what we have done in the same line ourselves, and so enrich and broaden our own ideas in this particular direction. Power is represented by an accumulation of ripe ideas, which to be of value must be an ever-increasing quantity. The careful hoarding of every item of experience that comes to him, either through failures or successes—for both must come to the man who leads a busy life in the engineering profession—must be the aim of every engineer if he would make himself a power in his profession. And it is the man who is most critical of his own work that becomes the man of rich experience.

Now it is often seen that the brilliant young man who, perhaps, has nothing to back him beyond a University training in the science of engineering is often sceptical as to the experience of older men in the profession. Mathematical and scientific training has taught him that engineering is an exact science, that all problems in connection therewith are capable of demonstration, and that once having secured what to him seem reliable data upon a given subject or problem the finished results must inevitably be satisfactorily and irrefutably arrived at. This is where he makes a big mistake. The engineer is not yet born who has discovered the exact way to apply the science of engineering to the ever-changing conditions under which he must do his work. The most careful and exactly thought-out designs sometimes surprise him by their utter failure; while, on the other hand, a scheme which may have failure written large upon it in theory as greatly surprises its creator when finished, and success attends it. Static laws and dynamic forces at times get hopelessly intermixed and muddled together, and the exact theorist finding his infallible reasoning so rudely shattered is glad to hand over the responsibility to the man of experience.

Now these few observations have not been written without a purpose. The object of them has been to instil into the minds of the younger generation—those who should now be industriously storing their mental granaries with ripe ideas—the need for a close concentration upon their work. Make a friend of it. Get on intimate terms with it if it is to provide the mine from which you expect to dig the experience that will eventually send you up the ladder of progress. Do not wait for, or rely on, someone to give you a push up behind, or grumble if someone else appears to outstrip you in the race because he has influence. Study your work, and you will find experience a far better helpmate than influence. Keep your experience fed by close observation, and by-and-by someone will be looking for a man in the possession of such experience as you have gathered together, and instead of having to shout your qualifications from the housetops to find a purchaser, you will be eagerly sought after, and experience will put you in a position such as you have been waiting and training for.

A visit will be paid next Saturday by the Midland Junior Gas Association to Droitwich, to inspect the Corporation Gas-Works, of which their President (Mr. F. Shewring) is in charge. Visits have also been arranged to the Covercroft Salt Works, the St. Andrew's Brine Baths, and the Brine Baths Park. Tea at Salters' Hall will close a full afternoon's programme.

The London and Southern District Junior Gas Association will next Saturday afternoon visit the works of the Lea Bridge District Gas Company (where their President, Mr. D. J. Winslow, is engaged) and the electricity works of the Walthamstow Urban District Council. The show-rooms of both undertakings will also be open for inspection by the members. The annual general business meeting of the Association will take place in the Westminster Technical Institute on May 23.

INFORMAL MEETING OF SCOTTISH GAS MANAGERS.

GLASGOW, WEDNESDAY, APRIL 2.

THE Thirtieth Annual Informal Meeting of Scottish Gas Managers was held in the Grand Hotel, Charing Cross, Glasgow, on Wednesday last

Mr. J. W. NAPIER (Alloa), the Convener, in introducing the President, Mr. Samuel Milne, of Aberdeen, said he was delighted to see such a large number present. Invitations had been issued not only to managers of gas-works, but to other men employed in technical works of a like nature, and to representatives of municipalities. He thought they might claim to offer an open door, and that the body was representative of the whole of Scotland. They had with them Bailie Paxton and Councillor Irwin, of Glasgow, Bailie Lindsay, of Leith, Councillor Nobel, of Dundee, Mr. Bryson, of the Pumpherston Oil-Works, Mr. Thomson, of the Oakbank Oil-Works, and Mr. Mason, a Scotsman from London, representing the British Commercial Gas Association. Mr. Milne, their President, occupied that day an exceptional position, as the address which they were to hear was the second presidential address that he had had to give within the last twelve months. He (Mr. Napier) was sure that the cordiality with which the North British Association was welcomed at Aberdeen would be in the recollection of every one of them.

Mr. MILNE then read the following

INTRODUCTORY ADDRESS.

Gentlemen,—In accepting the honour you were pleased to confer upon me in electing me to occupy the chair at this meeting, I did so little thinking that my ordinary duties were to be so pressing just at the time when I would be putting my few notes together. The meeting being of an informal nature, a prepared address should not be expected; but I propose to submit a few observations which, I hope, will provoke an interesting and useful discussion.

It should be understood at the outset that speakers will be allowed considerable latitude in their remarks, so far as the variety of subjects is concerned; and if my notes do not lead to a discussion, anyone may introduce subjects or relate experiences which, in his opinion, may be of interest or of service to the company here assembled. I believe it was the original intention of this Informal Meeting that gas managers might meet at the earliest possible opportunity after their winter's operations were over, and discuss informally—and without reporters, I presume—the difficulties they had been called upon to face during the winter.

In my own case, I am thankful to say that, apart from the troubles accompanying arctic conditions prevailing for some days at the end of November last, when the thermometer registered continuously for several days and nights in succession from 12° to 24° of frost, my own experiences during the past winter have been rather quiet and not unpleasant, notwithstanding the fact that I was left with practically no reserve retort power.

WATER-GAS PLANT AS A STOP-GAP AND STAND-BY.

The demand for gas following the introduction of the free cooker policy a year last September has gone on apace all through the winter, with the result that my attention had to be applied to the immediate introduction of carbonizing plant. This question has not been rushed, as it was evident five years ago that an extension would have to be faced. Vertical retorts having then made their appearance, and being, so far as their application to coal-gas making was concerned, in their infancy, I chose to await developments, and, in December, 1907, recommended my Committee to put down an installation of carburetted water-gas plant—a plant which I think should be installed more freely in the larger works than has been the case up till now, if for no other reason, as an emergency or stand-by plant. When you consider that the cold plant can be brought into action in 6 to 8 hours if required, and that, for a comparatively moderate capital outlay, you can have at your disposal a plant equal to 25 per cent. of the maximum output, worked by a matter of three men per shift, you must recognize the influence it has on threatened labour troubles. Again, when it is considered the relief that the use of oil can give during a coal crisis such as we recently experienced, this, too, should have some weight in recommending its installation. The only adverse circumstance to its adoption at the present time is the high price of oil; but this, I have no doubt, will rectify itself before very long.

THE WOODALL-DUCKHAM VERTICALS FOR ABERDEEN.

The introduction of the carburetted water-gas plant at Aberdeen allowed time for the vertical retort system to develop; and it is gratifying to know that, so far at least as this country is concerned, the home-born products find favour over the system that was evolved by our friends in Germany. Doubtless there are points of commendation in both intermittent and continuous systems; but my own preference is distinctly with the latter. Continuous carbonization is an ideal system, and appeals to me very strongly on account of the immunity from smoke and steam, and the comparative noiselessness of the whole system; the uniformity of temperature at which the retorts are capable of being maintained—there being no sudden and intermittent dumping of large quantities of cold coal into the hot retort; also the constant quality and quantity of gaseous and liquid products evolved are important considerations in favour of the continuous system.

The contract for the installation about to be put down at Aberdeen has been entrusted to the Woodall-Duckham Company. It consists of five beds, each of four retorts, each retort being 25 feet long by 3 ft. 10½ in. by 8 in. at the top, and 5 ft. 3 in. by 20 in. at the bottom, and capable of carbonizing 6 tons of coal per retort per twenty-four hours, or a total of 120 tons per bench of twenty retorts. Work has to be completed by Oct. 1 next. Doubtless some difficulties will have to be experienced in the matter of working and the choice of the qualities of coal best suited for the system; but these are experiences we look for in every new plant. Unfortunately, it will not be possible to determine the work done by the vertical settings by themselves until the summer of 1914; but we expect then to have them producing the whole of the coal gas for a few weeks, and with the aid of the carburetted water-gas plant to maintain the needed output. Working results should be then procurable.

FIRST COST AND MAINTENANCE.

The first cost of the plant is high, probably about £146 per ton of coal carbonized, inclusive of plant, foundations, chimney, building, framework, and also the conveying and elevating plant within the building. This is probably about £25 to £30 per ton more than horizontals, and, on an installation of the plant of the size we have gone in for, would represent a capital expenditure of nearly £4000 over horizontals. When the saving in labour alone is considered, however, the extra capital is justified, if one agrees that, for every man you can do without, you are justified in spending £1000 in capital expenditure. Regarding the maintenance of verticals, we have very little data to go upon. It would appear however, that the life of vertical retorts is so good that, although they have been in constant use for some four years, they do not appear to have required resetting, or even very much repairs. My own opinion is that the maintenance cost will not be anything less than that of horizontals. Even if it is greater, one can afford to meet it in view of the savings in labour charges, tear and wear of machinery, and fuel for steam raising.

ALLIANCE OF THE SHALE OIL AND GAS INDUSTRIES.

Now that the vertical retort is being so largely adopted in this country, and in view of the fact that it was employed in the manufacture of shale oil for many years before it came into prominence in coal-gas making, it would be well if a closer relationship existed between the Scottish representatives of the two industries. Such a coalition would, I am sure, be to our mutual benefit; and with this object in view, our worthy Convener has invited representatives of the principal oil companies in Scotland to meet with us to-day. In the light of their experience of handling shale in the distillation of oil by means of the vertical retort, I trust they may favour us with their views on the application of this type of retort to the carbonization of coal for gas making from a chemical and engineering point of view.

Scotland, the birthplace of the vertical retort, has been somewhat slow in adopting it, owing, no doubt, to the fact that only now have we been able to educate the public to the almost universal adoption of the incandescent burner. It is the changed conditions under which gas supply undertakings are now working that have permitted the use of vertical retorts for the production of illuminating gas. The standard of illumination has now been brought down to a level much more suitable for the various purposes for which gas is used, and, moreover, the lower candle power gas is much more easily brought to the point of perfect combustion than was the former highly luminous gas. This reduction of the luminous value has allowed of processes being successfully prosecuted which could not have been attempted when a high standard of illumination prevailed.

VARIETY OF VERTICALS IN SCOTLAND.

In Scotland, we shall have three distinct types of verticals in action before many months have passed—the Woodall-Duckham, the Glover-West, and the Wilson-Glasgow. The Glasgow settings are, I understand, doing very good work, though I have not yet seen any published results. It must be gratifying to our friend Mr. Alex. Wilson, as it is to his brethren in the profession in Scotland, to find that quite a number of Scottish gas-works are taking up this type of setting.

NAPHTHALENE.

There is one gratifying characteristic of the gas produced from

vertical retorts, and it appears to be common to all types—intermittent, continuous, and continuous-intermittent—and that is, the naphthalene content of the gas is so low as to cause absolutely no trouble in deposits either in the works or in the distributing system. Speaking of this subject, reminds me that naphthalene troubles are now becoming very frequent throughout Scotland; and it would be interesting and instructive if those who have been troubled would relate their experiences and the means they have adopted to overcome the difficulties. I am happy to be able to state that in Aberdeen we are, up to the present, quite immune from naphthalene troubles, both in our manufacturing and distributing systems. This is probably due to the fact that carburetted water gas is used, together with a proportion of cannel coal.

DISTRIBUTION—STEEL V. CAST-IRON PIPES.

In the distribution department, we are, I feel confident, on the eve of considerable revolutions in regard (1) to the substitution of steel tubes for cast iron, and (2) to the adoption of high pressure —more, however, for "boosting" purposes, to quote a phrase from our friends on the other side, than for distribution. Though my own experience of steel distribution pipes cannot be termed extensive, I have made a fair start with them; and, for the sake of eliciting a discussion, I am going to advocate steel tubing, well tarred, and covered with jute cloth saturated with tar or other bituminous and elastic compound. As regards the make of tube, while one's preference would naturally be for solid-drawn tubes than for lapwelded ones, I am of opinion that, if equally treated with preservative coverings, and having the strong rigid faucet joint, there is little to choose between them. The solid-drawn tube is limited, I believe, to 12 inches diameter.

Cast-iron pipes for the distribution of gas are far from ideal. Under certain conditions of the surrounding earth, they are rendered distinctly porous, and the diffusion of gas through the porous walls of the pipe is evidenced by the blackening of, and the smell emanating from, the surrounding mould. I have seen cast-iron pipes lifted out of certain moulds that could have been cut with a knife life a block of plumbago.

In these days of steam road-rollers and other heavy vehicular traffic, cast-iron pipes must be laid at a greater depth than is necessary with steel. This is a serious consideration, when it is required to lay additional pipes in streets that are already pretty well packed with gas, water, sewerage, electric, and telephone mains. Even at a depth of 2 feet, I have frequently found gas-mains broken during a period of intense frost, with the result that the gas, taking the line of least resistance, found its way into dwelling-houses, with its attendant dangers. A few years ago, we had an instance of a cast-iron water-main breaking during a frost, which, in turn, caused the fracture of the gas-main through undermining; and while scores of householders were without water at their water-taps, a free supply was issuing from the indices of their gas-meters.

PIPE JOINTING AND TESTING.

Then as to the jointing of cast-iron pipes. The turned-and-bored joint, with a small space for a strand or two of white yarn, and faced-up with about 1¼ inches depth of Vulcan cement, is, I consider, much to be preferred to the molten lead joint, however well staved. We must all admit that molten lead, like most other metals, shrinks when cooling; so that a considerable amount of judicious caulking must be applied in order to drive the mass home hard to hard. We must also admit that few jobs are more apt to be "scamped" than caulking; and there are comparatively few reliable caulkers to be found. This, then, raises the necessity for a systematic testing under pressure, which we may all favour, but few of us adopt, except in special circumstances.

What then can be said in favour of cast iron, unless that it is less liable to corrosion than steel, and possibly also less liable to electrolytic action? This suggests, then, that it is a *sine quâ non* to the adoption of steel for gas distribution that the pipe must be well protected against corrosion and acidiferous soils. Whether the bituminous protection for the prevention of corrosion is of any value as a safeguard against the slight stray currents of electricity permitted by the Board of Trade in this country, I cannot say; but I am inclined to the opinion that it would be.

The claims for steel over cast-iron pipes are that they are incomparably stronger, as they are capable of yielding, and therefore are unbreakable, and can be laid at a less depth; they are lighter to handle, and, being in long lengths, have fewer joints, and therefore fewer chances of leakage, and incur less cost in labour; they are absolutely free from the possibility of the diffusion of gas through their walls; and they can adapt themselves to the formation of curves if required. It is also claimed for them that they are of greater carrying capacity than cast-iron pipes, and cause less condensation, due to the absence of friction, on account of the smoothness of their walls. The labour saving and reduced chances of leakage are considerations which should go far to balance the slightly increased first cost of the steel over the cast-iron pipes.

Regarding the faucet jointing of steel pipes, there are two types —the ordinary open faucet, and the rigid joint, the design of which is doubtless familiar to you all. Cast-iron pipes are wholly rigid; and being subject, as all pipes are, to disturbing influences —such as subsidences, vibrations, and frost—they are very liable to fracture. The only flexible part in the line of piping is the lead joint; and where there are turned-and-bored-joints, there is absolutely no flexibility in the main. The result of disturbing influences is, therefore, a drawing of the joint or else a fracture of the pipe—more commonly the former. How much better is it to have a flexible pipe, with the only part where gas can possibly escape made perfectly rigid, such as you have in the steel pipe with the rigid joint.

Another type of joint which is claiming attention at the present time is the welded joint, which makes a continuous steel pipe line; but I am not aware that it has been actually used in this country. While such a joint could be made with comparative ease on a bench where the pipe can be turned about, its application to a pipe line in a trench would, I think, present considerable difficulties.

As regards the question of molten *versus* shredded lead or lead wool, I hope there will be a free discussion. Personally, I have only used the lead wool to a very limited extent. For repair work, we find it most convenient, as no fire is required for melting. For mainlaying, I have only started using it; and I find that the pipelayers of the old school do not like it. With the type of pipe and joint I have advocated, I would be quite satisfied with the molten lead, and, with my present light on the subject, I do not see the wisdom of using a material at double the cost, without some very substantial advantage.

There is one question before leaving the subject of distribution by steel that I should like to refer to, and that is as to how the admission of air with the gas for the revivification of oxide of iron *in situ* is to affect the interior of steel pipes. I believe some of my hearers have had experience of this, and it would be a favour if they would give us the benefit of it to-day.

Time fails me to refer to the ingenious service connections that can be used in conjunction with steel pipes, and to the still more ingenious contrivances now available for connecting gas services under pressure without escape of gas, which latter must become a great boon, particularly in making connections from high-pressure mains.

HIGH-PRESSURE DISTRIBUTION AND BOOSTING.

High pressure, as applied to gas distribution, may, I think, be defined as any pressure in excess of what is generally found in distribution without the necessity for the use of service governors. High pressure is not employed to any considerable extent in house-to-house distribution in this country, although I understand that in America it is fairly extensively adopted. In the Technical Press we get, from time to time, welcome glimpses of what is being done in this direction there. In this country, high-pressure supplies are fairly extensively adopted for "boosting" or augmenting the pressure in the low-pressure mains in outlying districts, or in districts which have outgrown the carrying capacity of the distributing mains. In Scotland, we have a typical case of its application for this purpose in Dundee, particulars of which were given in a paper read by Mr. Mitchell before the Eastern District of the Scottish Junior Gas Association in January, 1911. I understand that an extensive installation of high-pressure mains is in progress at Greenock at the present time.

In 1908, Mr. Keillor (then of Lochgelly) read a very interesting paper before the North British Association of Gas Managers, giving particulars of a system of high-pressure distribution which he had installed at Lochgelly. This was applied for supplying certain outlying districts or mining villages. In this case, high-pressure gas was used for the twofold purpose of district as well as house-to-house supply. The maximum pressure employed at that time was 60 inches. On the same occasion, Mr. Waddell, of Dunfermline, submitted a scheme he had on hand for supplying districts from 1¾ to 4½ miles distant from the works. He made provision for employing a pressure of 20 or 40 lbs. per square inch, and had an ingenious scheme for controlling the pressure by means of a pilot tube led back from the area of supply to a bell which acted on the steam inlet to the cylinder of the compressor situated at the works, thereby maintaining a uniform predetermined pressure at the point of greatest demand, which, of course, would necessitate an increased pressure at the outlet of the compressor during the period of greatest demand. It is very interesting to have these papers read; but their value would be greatly enhanced if we could have the benefit of their further experiences related to us to-day.

As a "boosting" plant, high pressure is ideal. Having, by means of pressure charts, ascertained the weak points in the district of supply, and the hours during which the deficiency occurs, and having calculated the probable requirements necessary to raise the pressure to the required standard during the period of deficiency, a high-pressure main, or ring pipe line, tapped at the most suitable points and coupled to the low-pressure mains through the medium of a Reynold's or some other approved governor, suitably located either in an underground chamber or otherwise, is indeed ideal, and worth emulation by those finding their distributing plant deficient. Such a boosting plant will only be required for a few hours in the evenings.

I cannot approve of a system which necessitates a continual pumping process to be carried on where gas is only being consumed in very small quantities and at times not at all—such as supplying an isolated district some miles removed from the gas-works. In such a case, I would strongly favour the erection of a gasholder of such size as would be equal at least to ten or twelve hours' supply, and send out gas at a high pressure—say, 20 lbs. per square inch—through a pipe of no greater dimensions than is necessary consistent with prospective requirements, which would fill the holder in three to four hours. The district would

probably be of such dimensions as would warrant a resident local inspector, who could be in touch with the works by telephone, and get gas as and when required. From the holder outlet he would have a station governor to control the pressure to the low-pressure distributing mains in the district. Such a system makes for safety through dispensing with high-pressure governors, as also the necessary tear and wear of the compressor and fuel for the compressing plant. It is the application of high-pressure transmission with low-pressure distribution.

The question of high-pressure distribution or transmission is one regarding which no hard-and-fast laws can be laid down, because every town practically has its own special and distinctive requirements and peculiarities, and each case must be considered upon its own merits. The loss in illuminants in high-pressure distribution should not be lost sight of. Mr. C. E. Botley, of Hastings, who compressed gas in a cylinder from 45 lbs. to 200 lbs. per square inch, found that a gas of 16·32-candle power became 16-candle power at 45 lbs. pressure, 15·18-candle power at 100 lbs., and 13·58-candle power at 200 lbs. He further experimented on the effects on the candle power of coal gas after compression to 200 lbs. per square inch, bringing it back to normal pressure, when he found that a gas of 16·1-candle power before compression at 200 lbs. pressure was reduced to 13·35 candles; but at 110 lbs. became 15·10 candles; at 50 lbs., 16 candles; at 5 lbs., 16·50 candles; and at normal pressure 18·41-candle power —showing a gain of 2·31 candles, or 14·34 per cent.

While this obtained in the experiments, it cannot be claimed in actual practice that the illuminants which are brought down, due to pressure, will be restored at the outlet of the consumer's governor. The hydrocarbons, once condensed in drip-boxes, cannot be re-absorbed to any appreciable extent. Another physical change that takes place in compressed gas is that it becomes dehydrated, and in some cases to such a degree as to prohibit the use of wet meters—the water being so rapidly taken up by the dry gas. This has also been found to affect the oils of the dry-meter diaphragms, and has necessitated an arrangement whereby the diaphragms have to dip in oil, in order to prevent them becoming stiff.

In a paper read by Mr. Webb before the Midland Association in 1908, on "High-Pressure Distribution at Stockport," the author stated that a reduction in illuminating power need not be feared with the qualities of gas as usually supplied, although no doubt there might be some loss in the case of a very rich gas, and that his experience at Stockport was that an actual gain was observed, which he attributed to the dehydration of the gas.

In his treatise on the subject of "High-Pressure Distribution," Mr. Walter Hole states very concisely the points of a general character which emerge as a result of the discussion of, and extended experience with, high-pressure distribution as reported in the Technical Press (principally that of America), as follows:—

(*a*) That all compressors and the machinery driving them should be duplicated.

(*b*) That it is unnecessary to run the compressors for all the twenty-four hours of the day; the elasticity of the gas in the mains and receivers being quite sufficient to maintain the supply at times of lowest consumption.

(*c*) That, notwithstanding the many fears which have been expressed, and the limited information as to loss of illuminating power in compression which is available, the experience, so far, has certainly not been such as to discourage the spread of high-pressure distribution.

(*d*) That the practical effect of compression is to dehydrate the gas.

(*e*) That, beyond a reasonable distance from the gas-works (say 200 or 300 yards), little trouble is experienced with condensation in the mains.

(*f*) That, in consequence, the laying of the mains with a definite fall is not so essential as in a low-pressure system. Any condensation collecting at any point may be readily blown out of the main through plugs left at suitable places.

(*g*) That in many cases screwed pipe is preferred to the open lead joint in the smaller sizes of mains for this purpose.

(*h*) That each consumer's governor should have a safety pipe attached, so that, in the event of any accident to the governor, the high pressure in the main should not be thrown upon the consumer's fittings. As an alternative, an automatic cut-off may be substituted, so that any excess of pressure would have the effect of shutting off the supply entirely.

(*i*) That this governor should have a valve opening of sufficient diameter to maintain the supply in the event of the pressure in the mains falling considerably below the normal, owing to any accident to compressors or other apparatus at the works.

(*j* That although smaller sizes would be fully adequate to transmit the quantity of gas required, in practice it is inadvisable, in view of the strength necessary to withstand the inevitable strains to which any distributing system is subjected, to use smaller sizes than 2-inch for mains and ¾-inch for services.

(*k*) That as a result of the dehydrating of the gas, the stoppage of the service pipes by frost is becoming a rare occurrence, although under low-pressure distribution they were very frequent.

(*l*) That another result of freeing the gas from moisture is to make the use of wet meters very inadvisable, owing to the avidity with which the dry gas absorbs water from the meter.

(*m*) That although on the face of it there seems to be very much more probability of interruption of supply in connection with high-pressure distribution, yet, as a matter of fact, although the system is still in its infancy, the interruptions have been remarkably few.

(*n*) That the mains should be of sufficient capacity to store half-an-hour's consumption at maximum, if compression tanks are not used.

(*o*) That where compression storage tanks are used, these should not be concentrated at the works, but should be placed at "delivery points," and made part of the distributory system.

STAND-BY CHARGES FOR METERS.

Turning, now, to one or two other features in the distribution department, permit me to refer to a matter that came under my consideration some time ago—the question of charging rents for meters which were being used as a stand-by to other forms of light and power. I had more particularly in view those who had suction-gas plants, and who used the town's gas supply for starting-up these plants and for emergencies. As these consumers demanded a meter of sufficient capacity to drive their engines at full power, which, in some cases, represented 200-light and 300-light meters, it became a matter of considerable importance that the interests of the department should be safeguarded. In arriving at a fair charge to make, I had the average consumptions of 489 meters taken at random from the various consumers' ledgers, as follows:—

No. of Meters Taken.	Size of Meter. Lights.	Average Consumption per Annum. Cubic Feet.
84	10	50,400
78	20	64,900
72	30	126,500
61	50	151,800
36	60	148,700
51	80	339,000
63	100	384,400
25	150	587,600
12	200	540,900
2	250	1,134,600
4	300	635,300
1	400	1,299,300

The outcome of this was that a resolution was passed as follows:—

> That all meters used on the stand-by or intermittent supply shall consume annually a quantity of gas equal to 2000 cubic feet per "light," represented by the size of meter employed, or that a rental be paid according to the following table, which shows (1) the sizes of meters in "lights," (2) the annual rental of each size of meter, and (3) the annual quantity which will be required to be consumed by the respective sizes in order to be rent free.

Size of Meter. Lights.	Rental per Annum. s.	Minimum Consumption Required per Annum. Cubic Feet.
10	5	20,000
20	7	40,000
30	9	60,000
50	13	100,000
60	17	120,000
80	22	160,000
100	28	200,000
150	38	300,000
200	50	400,000
250	58	500,000
300	68	600,000
400	88	800,000

The consumptions to be reckoned and the rentals charged as at the April state-taking each year. A *pro ratâ* charge to be made for meter rental for any portion of a year less than twelve months.

Example.—If a 200-light meter is in use, and the annual consumption of gas is 400,000 cubic feet or over, no rental would be charged; but if the consumption were 200,000 cubic feet, or any quantity less than 300,000 cubic feet—which quantity could have been supplied by a 100-light meter—then the rental of a 200-light meter, which is 50s., would be subject to a reduction equivalent to the rental of a 100-light meter, which is 28s.—making the net rental chargeable 22s. per annum.

It may be noted that the rentals are taken at about 10 per cent. on the list prices; and the minimum consumption required per annum to yield a rent-free meter is, in nearly every case, only about half the average consumption actually obtained by such meters under ordinary circumstances.

By this arrangement, the stand-by or intermittent consumer is put upon an equal footing with the average gas consumer, and pays his due proportion towards depreciation of the unremunerative capital employed in his interests.

THE SUPPLY OF GAS-COOKERS IN ABERDEEN.

I am frequently asked upon what terms and conditions we supply gas cooking appliances; and, as there are different opinions as to what conditions, if any, should be applied, I shall run over the various clauses relative to Aberdeen:—

(1) The Corporation will supply and fit up free of charge for each approved consumer who makes application (subject to these conditions, and to the suitability of the premises and the interior piping), one article, either a gas-cooker, range plate, or griller, as may be selected, complete with all necessary connections and piping up to 50 feet. Not more than one article will be supplied free. Power is reserved by the Corporation to charge rental on appliances of greater value than £4 net, at the rate of 10 per cent. per annum on the net cost above £4.

(2) The consumer, in accepting a gas cooking appliance, must guarantee an increased consumption over what the Gas Department may consider his average lighting bill, and amounting approximately according to the following table, failing which, the Corporation reserve power to fix a smaller appliance in proportion to the average consumption—viz.:

	Cubic Feet per Annum.
Size No. 1 must yield an extra consumption of	8,000
,, 2 ,, ,, ,,	10,000
,, 3 ,, ,, ,,	12,000
,, 4 ,, ,, ,,	16,000
,, 5 ,, ,, ,,	20,000
Range-plates ,, ,, ,,	5,000
do., with coal-range oven fitted for gas	6,000
Griller must yield an extra consumption of . .	3,000

(3) Where a gas-cooker or range-plate is not required, a gas-griller will be supplied and fitted up free with composition piping. If fitted with flexible tubing in addition, the flexible tubing must be paid for by the consumer.

(4) The stove must be kept in regular use by the consumer for a period of not less than one year. Should the stove be removed earlier at the request of the consumer, or shifted from one part of the premises to another, the consumer must pay the cost of labour and materials employed in the fixing and removing.

(5) In the case of a consumer intending to remove from the premises in which a gas-cooker, range-plate, or griller is installed, at least one week's notice, in writing, must be sent to the Gas Department of such intended removal.

(6) The Corporation shall keep the cooking appliance in good repair, and the consumer shall take all reasonable care of the appliance, and be responsible for its safety.

(7) The Corporation shall not be liable for any loss or damage which may arise from, or be caused by or through the use of, the cooking appliance.

(8) The consumer shall have no claim against the Corporation, and shall free and relieve the Corporation of and from all claims at the instance of the owner of the property in which the cooking appliance is installed, in respect to any damage which may be done to such property in connection with installing the cooking appliance or fittings connected therewith.

(9) The badge stating that the cooking appliance is the property of the Corporation must not be removed.

(10) The cooking appliance shall remain the property of the Corporation, and the consumer must not remove or permit it to be removed from the premises in which it is installed.

(11) The position of the cooking appliance, method of laying on the gas supply, and the arrangement of fittings, as well as the description and size of the cooking appliance to be used, shall be determined by the Engineer of the gas-works.

(12) The inspectors of the Gas Department shall be allowed, at all reasonable times, free access to the gas cooking appliance and fittings.

The application for a gas cooking appliance is signed by the consumer, and is in the following terms:—

> I hereby request the Town Council of Aberdeen to supply me with a gas.....for a period of not less than one year, for house occupied by me, and situated at....., subject to the above terms and conditions, which are held to form part of this application.

GAS-FIRES.

My views on the question of free gas-fires are probably well known to you. I do not approve of free fires, but am strongly in favour of a rental. Gas-fires are only used very intermittently, and mostly during the dark winter months, at a time when our generating plant is taxed to its utmost, whereas gas cooking appliances are used principally in the summer months, and are in regular daily use.

COAL PRICES.

At a time like the present, when many of us are about to enter into contracts for the year's supply of coal, I cannot refrain from referring to the abnormally high prices we are likely to be called upon to pay for this commodity, and lamenting the export from our country of the millions of tons annually of this unreplaceable national asset. It is like letting out the very heart's blood of the country's industries, while at the same time it is assisting other nations to combat our home industries, by raising the price of coal for home consumption without so much as a grain of compensation in the form of a coal-tax wherewith to gratify the insatiable appetite of our Chancellor of the Exchequer. To me, it appears a suicidal policy.

There is no doubt that the price of coal has been further increased by the extra expenses involved in the operation of Acts of Parliament such as the Eight-Hours Act and the Minimum Wages Act—legislation created for a class of men who knew very well how to legislate for themselves. The National Insurance Act, the higher price of timber and stores generally, the higher standing charges owing to restricted outputs, further restricted on account of the scarcity of waggon accommodation provided by the railway companies, together with a "trifle" more profit for the coal masters, are all contributory causes to the increased price demanded. This increased price, together with the increased railway rates and freightage, increased wages bill, increased everything, presents rather a gloomy outlook for the gas industry. But the law of supply and demand holds good as ever; and we must grin and bear it, and even rejoice that a wave of prosperity has come over the land, and look around for other ways of economizing, and hope for a speedy return to a more moderate figure.

The coal contracting season is at hand. It is anticipated that the railway companies are to increase their rates for the conveyance of all goods, including minerals. In anticipation of an increased rate, where it has not already been applied, the coal contractor must put on to his old price for coal such an amount as he anticipates will cover him for the increase. This, I think, would be unfortunate; and I would suggest that, in all tenders for the new season's supply of coal, the contractor should insert a clause to the effect that the prices quoted are based on their existing rates, and that in the event of any increase in railway rates taking place during the currency of the contracts the increases will be chargeable to the purchaser. Such a proposal would, I consider, be fair to both parties; and it would give the gas companies and corporations the benefit of the existing rates so long as they are in operation, rather than anticipate the advances which have been already indicated by the railway companies.

There are so many problems engaging the attention of gas engineers at the present time that it would be impossible even so much as to name them here. I have only touched on a few points of daily interest to us as gas managers; but I trust they may be sufficient to create a lively discussion and interchange of opinions and ideas.

DISCUSSION.

Mr. NAPIER, the Convener, inaugurated the discussion. He said Mr. Milne had gone over a great many interesting points, and had dealt with the subject of gas distribution in a very interesting way. At the present moment, gas managers were faced with the economic difficulties inherent in an increase in the price of coal. This increase had succeeded the increase that took place last year, and it was possible that many gas undertakings would be faced with the question of increasing their prices. The elasticity of gas undertakings was a very wonderful thing, however; and in this connection they could not but be satisfied with the enormously increased consumption of gas all over the country. He was sure that in a number of instances increases in the price of gas would, if possible, be avoided. Mr. Milne had made reference to the many advantages of carburetted water gas. He always believed in the advocacy of these points. There were the examples of Dundee, Edinburgh, and Aberdeen, with water-gas plants; but they had the notable exception of Glasgow not having water gas. Why had Glasgow not adopted water gas? It must be admitted that the high price of oil was an element against it. He thought Mr. Milne was perfectly accurate in his conception of gas when he said he was not in favour of free gas-fires. But they must carefully consider the question in the interests of other gas consumers who had not the advantage of using gas-fires. Gas-cookers were common to practically all householders, and certainly yielded a good average consumption. In the case of gas-fires, however, they had not only the variety of appliances, but they had not an average consumption per annum. They all agreed that the advantages of steel pipes were considerable.

Mr. ALEX. YUILL (Dundee) said, considering the points raised, there was one that stood out very promiently. That was Mr. Milne's mention of a large increase he had experienced since September last, which was attributed to the extended use of gas-cookers. While he had had these in operation for some time, and had had the same experience in the past as Mr. Milne, he also had the satisfaction of feeling that these increases still continued. The fact remained that this year they had had an increase of over 60,000,000 cubic feet, due not to lighting, but to heating and cooking. Even the high price of coal was, in his opinion, going to be a friend in disguise; and possibly it would react against those who were experiencing the benefits. He referred particularly to the coalmasters. Coal merchants generally occupied but intermediate positions. The present high price of coal was certainly influencing a great many of their consumers to go in for both heating and cooking by gas. Some attributed this growing popularity of gas heating and cooking to the British Commercial Gas Association. But while he gave all credit to Mr. Mason, and was proud to see him in the position he now occupied, he thought one of the great factors in the increase was due to the high price of coal. It was influencing the housewife to become independent of the coal merchant. The change had come to stay; and people would find that in the summer the coal merchants' trade would have gone to the vanishing point. In towns that had lately introduced gas appliances for heating and cooking, there was practically little use for coal. He referred particularly to the concessions to consumers made by corporations who had no vested interest—only the good of the whole community. Like Mr. Milne, he had experienced benefit from carburetted water-gas plant. By its use last year, they were able to tide over their difficulties. Mr. Napier had mentioned that they had some of their oil friends with them. They liked to be friendly with these people; but he would like to warn them that they could "kill the goose that lays the golden eggs." By advancing the price of oil, they had practically killed the goose. Unless the price of oil went back, it was impossible they could use more next year. So long as the price remained at its present high level, its use would be considerably curtailed. The question of verticals was engaging all of them. Most of them had been pioneers, like Mr. Blair, of Helensburgh, who would, he was sure, have pleasure in seeing gas managers tumbling over each other to follow him. They could not escape

consideration of the lower price of carbonizing and the lower cost of renewals. Those who had had these retorts in use for some time already appreciated that the wear and tear occupied quite a different position from the wear and tear of horizontals. With the latter, the machinery charging or hand charging was always, in the raking out, causing contacts with the sides of the retort; but with the verticals it was different. Above all, there was the labour saving on which they were worked. These facts pointed to ideal working conditions, and anyone requiring an extension of carbonizing plant certainly would be well advised to study this question in all its phases. The Chairman spoke about revivification of oxide of iron; and he was afraid of the risk of the oxygen passing on and possibly causing depreciation through oxidation of the fittings, and steel pipes particularly. But it all ought to be absorbed in the oxide of iron. In his opinion, they had a worse enemy—that was, the cyanides. He experienced more difficulty with the corrosive effects of the cyanides, even from the cylinders to the meters. As they were aware, they had installed high-pressure two or three years ago. They found they had a uniform pressure throughout the whole time.

Mr. W. M. Mason (the Secretary of the British Commercial Gas Association) then spoke for the purpose of laying before the meeting some of the claims of the Association. There were points in the President's address which were applicable to their present position. The President referred to Scotsmen always leading in the gas industry. They had led from the first; but he was very sorry to say they did not lead so far as the British Commercial Gas Association was concerned. The largest subscription was from the largest Gas Company in the world, and the second largest was from almost the largest Corporation in the kingdom—Glasgow. They were glad to have the second largest subscription coming from Glasgow. But it seemed to him that it was strange that, with Scotsmen leading in other avenues of life, out of 262 concerns only 26 were members of the Association. He believed it was because they did not quite understand it, and because they did not believe it to be the business proposition which it was. It was not a philanthropic question. The Association were helping them, and were bound to help them. Take it from the common business standpoint. If a firm spent £10,000 a year on advertising, they did it because they showed results for it. The British Commercial Gas Association proposed to spend £15,000 this year. Mr. Mason then went on to quote from a booklet on "The Aims and Policy of the Association."

> The ultimate aim of the Association is to increase the sale of gas throughout the kingdom. To this end it seeks, by publicity in newspapers and periodicals of widespread circulation, to make better known to the public the many uses and advantages of gas; and to overcome those lingering prejudices against its use which are founded upon theories that have no relation to modern conditions, but are sedulously fostered by interested parties.
>
> A great deal in this direction can be, and has been, done by local effort. But local effort cannot possibly do all, or nearly all, that needs to be done to defend and forward the interests of the industry. The Association, moreover, aims not only at augmenting local by national publicity work, but also at being of material assistance in the carrying on of local campaigns.
>
> It is one of the main features of its policy to give to each of those who co-operate the benefit of the experience and knowledge of all; and it is not the least of the advantages of this co-operative movement that every member receives the stimulus that comes from knowing what is being attempted and accomplished elsewhere.
>
> The office of the Association constitutes an information bureau in respect of the commercial aspect of the industry, to which every member has the right to apply.

Mr. Alexander Wilson (Glasgow) congratulated Mr. Milne both upon his paper and his audience. He would like to say he had never been converted to free fires. He went the length of hiring fires and hire-purchasing fires, and the same with water-heating appliances. With reference to steel mains, they had laid a good many, and they were satisfactory. He thought they would continue so for long lengths of pipe; but in working about streets, the placing of steel mains and the joining of them was rather more difficult than with cast-iron mains. There would be a good deal of waste in this direction with steel mains; and it would be difficult to work with both steel and cast iron in the street-mains. Regarding water gas, the real reason they had never gone in for it was because they could make their coal gas so very much more cheaply. They once had water gas; but they were losing upon it. Therefore they departed from its use. When making coal gas, they were sending out gas of one quality. If they began to mix it with water gas, there was a different composition. Adjustment required to be different with a water gas. In their circumstances, they were quite wise in providing a constant supply of straight coal gas at the cheapest rate. Some very interesting remarks had been made about their coal contracts. There was no question that they would have to pay more for coal. The only way to compensate for this was to get an increased consumption and give out gas-cookers free. Their extensions and the business done gave them an extended output. They were sending out more than 2 millions extra every day; and this had been going on for a considerable time. A great deal of this extra consumption had been due to the help they received from the British Commercial Gas Association. They had subscribed pretty handsomely to it, and they had obtained more than full value back from the outlay. Most gas managers did not know how much they might get out of the Association. Everyone would be well advised to give the matter serious consideration and take it up in the proper spirit, putting Scotland in the same position as the southern part of the country.

Mr. William Wilson (Falkirk) said he was long ago converted to the advantages of joining the British Commercial Gas Association; but unfortunately he was in the position that he could not at the present moment persuade the "powers that be," in the shape of the Corporation, to join. There was no doubt that the Association were doing them a good turn; and he hoped the day was not far distant when Falkirk would be on the list of subscribers. Regarding vertical retorts, the question had occurred to him of reconstructing a retort-bench. He would like to raise the point of the weight per square foot on the foundation. In the case of vertical retorts, it amounted to as much as 3 tons per square foot. They would require to build an ark like Noah, their foundation was so bad. But no doubt this could be got over. As to reduced candle power, unfortunately the Falkirk bairns would not put up with less than 17½ candles. If they fell back on verticals, they would have to enrich. Regarding the question of naphthalene, some of them had been much troubled with it; and Falkirk had been badly hit. They had spent from £300 to £400 a year in extra gas-fitters attending to complaints due entirely to naphthalene. Last year they put in a naphthalene washer, and were in the midst of experiments with various kinds of oil when they had a calamity. But there was a silver lining to every cloud. The calamity referred to was an explosion. The condenser was blown to pieces during the first week in December; and simultaneously with the condenser exploding, the naphthalene disappeared. It was a very happy position to be in. For two or three weeks previous to the explosion, they had 187 complaints out of 600 lamps; but they had only had twelve complaints since the explosion, and these were in the week that succeeded it. As a remedy to the naphthalene nuisance, the condenser should be suited to the needs of the works. Of course, he did not advise them all to burst their condensers. He was at one with the President on the subject of steel mains. He was converted to his opinion by the reading of a book on "Distribution by Steel." He had had some experience of laying steel mains, and they had been satisfactory experiences. The first stretch he laid was about 1½ miles; and it had been in use for 4½ years. It was only a 3-inch pipe, laid at a depth of 3 feet. They tested the main by shutting it off and passing gas into it through a small meter, and found there was no leakage. They had tested it each year. He would strongly advise anyone to adopt some method of pressure testing. The term high pressure seemed to him entirely wrong. From 2½ to 5 lbs. was not high pressure. The most of the situation was being made by the electrical men, who said lives were in danger because gas was being sent out at such a high pressure. Gas men were to blame for letting this wrong expression get about. What they should call it, he did not know. Nothing less than 100 lbs. to the square inch should be reckoned high pressure.

Mr. Bryson (of the Pumpherston Oil Company), when called upon by the Convener, said he was a pupil of one of their famous members, William Young. When he first joined the oil trade, he had him for a teacher. He visited him regularly every week for the purpose of hints and guidance in his work; and it was a very great help. He often read with considerable interest the papers which Mr. Young had delivered at their meetings. In connection with vertical retorts, he frequently wondered why Mr. Young had not introduced them much earlier to the gas industry. That Mr. Young had very clear ideas regarding the matter, he was fully aware; and he often talked over the subject with him. The retorts they were working just now were circular, which was contrary to the usual construction. These retorts in Scotland just now were retorting more shale than all the other forms of retorts that were being used. He himself was responsible for retorting more than 3000 tons of shale per day; and through a long period of years he had had very little trouble. He was not in a position to say that the retorts they constructed would be suitable for a gas-works; but so far as up-keep was concerned, he thought their experience was quite adequate for guidance. He had retorts that had been working for sixteen years without having been repaired. Accidents might, of course, happen to them; but they were working, and doing good work, to that day. The different conditions under which gas-works retorts operated might have a worse effect, in consequence of the higher temperatures at which they were working; but he gathered from what Mr. Yuill said that the heat of the retorts did not matter so much as the mechanical action. They found this just the condition with shale retorts. The temperature at which the retorts were worked was not very destructive; but the friction of the material moving down through the column had an effect. He had no doubt whatever that retorts built upon the same general lines as those at present used in the Scottish oil trade would be quite successful if installed in any gas-works. He had seen most of the vertical retorts introduced in gas-works; and what had struck him in every case was the amount of machinery there was about the place. It seemed to him that, had it been in an oil-works, it would have required all the oil produced to oil the machinery. With their retorts, there was little of this to be seen, and the labour was reduced to a very small extent indeed. For instance, they had one man at the top of the benches. His duty was to charge 120 tons of shale in his shift of from six to eight hours. They had another man at the bottom of the retorts, whose duty was to draw or drop this 120 tons. They had another man at the top of the spent shale heaps, who emptied this. For the 120 tons, one man could do

the work; the labour in that case being as low as they could expect to have it. At present they paid on coal sent into their works only a half more per ton than they got for the products of a ton of shale. If they did not work on economical lines, the Scottish oil trade could not exist.

Mr. THOMS (Oakbank) remarked that Mr. Bryson had covered most of the ground from their point of view, and there was little left for him to say; but he and Mr. Bryson did not agree as to whether the round or the oval retort was the better. He advocated the oval retort, and it gave a bigger heating surface.

Mr. ALEX. WADDELL (Dunfermline) said he had long spoken of the advantages to be secured by calling upon the oil-works managers. There was plenty to gain, even outside the vertical retorts themselves. He did not think he was wrong in saying that the oil-works had been the pioneers in vertical retorts. While there might be a difference in the temperatures employed in the case of oil-works and gas-works, it was just a matter of degree. It had been said that to make gas one ought to apply the greatest heat at the top. In oil-works, it was the other way. In the case of shale-oil works, one could not get the highest temperature at the bottom, because of the immense amount of steam being sent in. On the other hand, they could not get the highest temperature at the top, because they were pouring in coal. If they looked at the flues in the one and the other, they would find the coal-gas retort and the shale-oil retort had their highest temperature in the flues somewhere not far away from the centre.

Mr. WILLIAM BLAIR (Helensburgh) said that at his works he had given some study to vertical retorts. He followed Mr. Young very closely in the different lectures he gave them on the vertical retorting of shale, and thought he might be able to introduce the system in Helensburgh. They were now working it. There were little wrinkles to learn, but nothing that he would not face again with pleasure. There was no doubt that, if they wanted to make the most of a ton of coal, they should use the vertical retort. In his own case, a fourth of his retorts would have to be let up and down every year. Those they let down last year they put in this year without any trouble. He examined one or two after they had done 22 months' work, and failed to see any deterioration, except a few small fissures. They did require a little lubrication, but not too much. He was glad to see he had a few neighbours in Scotland following in his footsteps.

Mr CHARLES W. KRAUSHAAR (of the Bryan Donkin Company) spoke of the advocacy of a gasholder on an out-district. He did not agree with this method, but preferred the alternative of a larger pipe line, which was able to carry a sufficient quantity for the day consumption under holder pressure from the works. As mention had been made of the Reynolds governor, he might add that this was arranged to reduce both high pressure and holder pressure—taking up all variations in consumption. There was also the point that when used for industrial purposes and shop lighting it was necessary to maintain a continuous high pressure, and several instances were now working successfully where a supplementary supply for lighting was taken off the transmission main. The governor device regulating the speed of the engine had been brought to such a state of perfection that the speed was practically dead-slow during the hours of the day load. One instance in England recently came under his notice where the cost of a steel main and compressing plant came to £6000. The alternative low-pressure main would have cost £17,000. The great recommendation for the high-pressure and transmission system was its flexibility. There was no doubt that the high-pressure system in distribution had come to stay. They had to manufacture a satisfied consumer; and the best way to do this was to give a heavy pressure.

Mr. HENRY O'CONNOR (Edinburgh) remarked that the President had referred to putting steel pipes at a less depth than cast-iron ones. He could not agree. The question of depth was not only for preventing damage to the pipe, but was to keep a regular temperature, if possible, inside the main, and prevent the gas being cooled too much in cold weather. Mr. Yuill had remarked on the action of the oxygen. He would remind them of the very excellent remarks made by Professor Lewes on the oxy-oil process, where it was suggested to use oxygen with the oil. He clearly showed that every morsel of the oxygen taken in with the oil in the first instance must have been used up in the purifiers. Not only was there no possibility of the oxygen passing, but the extra oxygen put into the oil gas was absorbed by the oxide.

Mr. J. M'LEOD (Greenock) said that during many tests of coal gas purified both by lime and oxide of iron he had never yet come across a gas free from a trace of oxygen. His experience with steel mains was limited to 8-inch pipes. He had not yet met a "rigid joint." It was only a relative term. In regard to welding, Mr. Milne had said he did not know of any large scheme of welding joints in existence. There were, however, a considerable number of welded joints coming into use. He had seen the process at Messrs. Stewarts and Lloyds; and it was the easiest thing imaginable. He thought they must pay particular attention to the welding of joints in the future.

Mr. MILNE, in replying to the discussion, said Mr. Alex. Wilson had had something to say in regard to carburetted water gas, and seemed to speak of adulterating the gas. He (Mr. Milne) did not like the term. They all admitted that the specific gravity of carburetted water gas was greater than straight coal gas, and to use a large proportion one day and a small proportion the next would certainly upset the incandescent burners. He did not think there would be much upsetting by the admission of pure air through purifiers. Mr. William Wilson had referred to the relation of weight to foundations. In the plant at Aberdeen, the pressure would not exceed 1½ tons per square foot. As to the troubles from naphthalene and the expense of £300 to £400 that had been entailed, if Mr. Wilson would admit that a proportion of cannel coal would overcome the trouble, why not invest in cannel coal? They were certainly indebted to Mr. Bryson and Mr. Thomson for their remarks on the shale-oil industry. Using a gas such as they were employing for heating the retorts, the wear and tear on them, due to variations of temperature, could not be so much as with coke firing. He was pleased to know that welded joints had been so largely adopted, as had been indicated by Mr. M'Leod.

VOTE OF THANKS—NEXT YEAR'S PRESIDENT.

All the speakers had referred with pleasure to the interest of Mr. Milne's paper, and he was accorded a hearty vote of thanks on the motion of Mr. D. MACFIE, of Edinburgh. Mr. Napier, the Convener, then called upon Mr. William Wilson, of Falkirk, to come forward as their next year's President. Mr. Milne handed over the chain of office; afterwards moving a vote of thanks to the Convener.

Dinner and Entertainment.

At the dinner which followed the informal meeting, Bailie PAXTON, the Convener of the Glasgow Corporation Gas Committee, gave the toast of "The British Commercial Gas Association." He remarked that when first Mr. Wilson, their Gas Engineer, mentioned the subject two or three years ago to the Gas Committee, before the start of the Association, it was treated with something akin to contempt. But for some reason or other he rather liked the idea, because he had always held that gas undertakings never advertised their works sufficiently. He thought the British Commercial Gas Association were going to do the work which they (the gas people) had failed to do themselves. He considered it was the duty of every undertaking, be it corporation or private company, to contribute to, and give a send-off to, the huge undertaking that had been established in London during the last two years. As to their own Gas Department in Glasgow, they had travelled a good way; but he did not think they had travelled nearly far enough. When he saw the immense increases in consumption all around, he could not but believe that the British Commercial Gas Association were causing it. In Glasgow, the Gas Department had commenced to work up their own bye-products. They had started in earnest. They were not going to manage three-quarters of their gas undertaking and leave others to manage the other quarter. He believed it would be a success. But what he would like to do before he left the convenership of the Gas Committee was to see that people got free gas-fires. He had an idea it would pay the Corporation.

Mr. MASON gave a fitting reply. Councillor IRWIN moved the toast of "The Gas Industry," and Mr. MILNE replied. "Kindred Associations" was in the hands of Mr. YUILL, and the reply in those of Mr. JAMES M'LEOD.

MEASURING THE FLOW OF THE DERWENT.

Readers of the "JOURNAL" may remember that Mr. Edward Sandeman, M.Inst.C.E., was the Engineer of the scheme for utilizing the waters of the Derwent for the supply of the districts represented on the Derwent Valley Water Board. At the meeting of the Institution of Civil Engineers last Tuesday, he read a paper on "The Measurement of the Flow of the River Derwent," in which he furnished the following particulars.

The flow of the Derwent has been measured since 1905, when a weir was built by the Water Board to ascertain the yield from an area of about 50 square miles of the northern portion of its watershed. This area varies in elevation from 500 to 2060 feet. Rain-gauges to the number of 46 were fixed on this area, being approximately one to each 700 acres. In the last thirteen years, the recorded rainfall has averaged 46·34 inches. The lowest rainfall of any gauge was 34 inches; the highest, 61 inches.

The measuring weir is in two parts, one 90 feet and the other 30 feet wide; the latter being 18 inches lower than the former, so that it will measure the lower flows. Since the pool formed by the weir tends to silt-up, openings were made in the weir (provided with wooden doors), through which the deposited material can be removed by sluicing. A floating boom is placed across the river above the weir in order to catch trees, timber, &c., and prevent damage to the knife-edge weir.

The highest flood on the drainage area occurred before the building of the weir. It was calculated to have reached a flow of 486 cubic feet per second per 1000 acres from an area of 9321 acres. The minimum flow recorded was 0·29 cubic foot per second per 1000 acres. Records of evaporation from a water surface 6 feet square showed a variation from 10·25 inches in 1907 to 19·62 inches in 1911. The general result of the measurement of the rainfall and the yield of the river showed that the quantity of water collectable was, on the average of the seven years under consideration, equal to 75·2 per cent. of the rainfall.

There will be a meeting of the Yorkshire Junior Gas Association in the Municipal Technical College, Bradford, next Saturday afternoon. An anonymous address will be delivered on "Carbonization," illustrated by lantern slides and diagrams; and after the meeting the members will proceed to the Thornton Road Gas-Works to inspect the vertical retorts which are now working.

THE MIXING OF GAS AND AIR FOR LIGHTING AND HEATING.

By Franklin Thorp, of Manchester.

[A Lecture given at the Manchester University before the Manchester and District Junior Gas Association.]

I trust the notes and experiments I shall bring to your notice to-day will be of more than passing interest, as I feel the great responsibility that rests upon me. I have been entrusted to deliver the first lecture given by one of our own members in this room (associated as it is with the names of so many eminent lecturers in the world of science), and trust your confidence will not have been entirely misplaced.

In compiling these notes of the thoughts and experiments of my father, my brother, and myself, I have ventured to leave the beaten track. This perhaps will not come as a surprise to my many friends here, as we have seldom adhered to rigid formalities; and I hope the results of some of our inventions have justified our procedure. It will be noticed as I proceed that the personal element is somewhat conspicuous; but knowing the majority of gentlemen present would be friends, I felt you would be interested in our own work, and be able to appraise properly the motive that prompts this course of action. I wish at the outset to acknowledge publicly the great kindness I invariably receive from engineers with whom I have the honour to come in contact, and the assistance they have given by means of suggestions from time to time. The gentlemen who will be mentioned in connection with some of the apparatus will, I trust, accept my warmest thanks for their assistance, and at the same time, gentlemen (like Mr. Kendrick, of Stretford, and Mr. Barrett, of Birmingham) whose kindly help does not come under the head of apparatus shown to-day, will, I hope, know they are not forgotten.

This is, I think, a very fitting occasion to mention that our worthy President's ambition would be partly realized if collaboration could be arranged between the Professors of this University and the gas engineers of the district, somewhat on the lines of the association between myself and (say) Mr. Newbigging; for if good can come from a middle man like myself associating first with one side and then the other, many results of great value must of necessity come from the association of, for instance, Professor Dixon on the one hand, and (say) Mr. Glover on the other.

I have not gone into the question of the history of this subject as is usual, mainly because it absorbs so much time, but also on account of the advice tendered by our Technical Press to give something of one's own experience and, if possible, something new. The latter is difficult; but I trust to-day there will be something new for someone, if everything is not new for everyone.

As I proceed, it will be observed that many remarks and explanations will be omitted; and I have wondered how these will be interpreted, as there are two points of view: (1) I may have assumed that your own knowledge would supply the missing links, or (2) I may have adopted a simple expedient of covering my own ignorance. Anyhow, I shall have to risk it.

Three Methods of Mixing Gas and Air.

We will consider three methods of mixing gas and air: (1) Using gas at a pressure and inducing the air. (2) Using air at a pressure and inducing the gas. (3) Using both at a pressure.

Under the first head are included both high and low pressure bunsen flames. Low-pressure bunsen flames having been fully dealt with from time to time, and high-pressure flames for heating purposes having been explained so thoroughly by Mr. E. W. Smith, I shall confine myself principally to high-pressure lighting.

We all know the value of a little extra pressure for incandescent lighting purposes, and particularly for inverted burners. The value of this was forcibly brought to my notice many years ago by Mr. Hill, of Stalybridge, who called me in with respect to a large mill at the lowest point in his district where the pressure was low. We introduced first a small booster; but instead of being content with 20-10ths, we put the pressure to 60-10ths, and adjusted the burners accordingly. We found the result so good that we at once instituted experiments, and with the aid of our President, Mr. Hollingworth, who made tests of the candle power, the system now known as the "Textile" system was evolved; and to-day there are almost 100,000 of these lights in use in the mills of Lancashire and Yorkshire. I have mislaid the actual tests made in those days; but I know we got a mean hemispherical candle power of about 40 candles per foot. We found that the higher pressure enabled us to mix more efficiently the gas and air, and burn it in a smaller area, thus producing a hotter flame with a great increase in illumination.

The table given by Mr. Evans at the last lecture shows at a glance the explanation of the increased efficiency of hotter flames; and I do not think it necessary to apologise to you for again introducing it, as it is most instructive. You will notice I have added some figures in italics to show the great increase in illuminating power for a small increase in temperature.

Absolute Temperature.	Increase.	Light in Hefners per Sq. Millimetre.	Increase.
1464°		·005	
	60°		*2*
1524°		·01	
	221°		*10*
1685°		·05	
	300°		*20*
1764°		·10	
	518°		*100*
1982°		·50	
	628°		*200*
2092°		1·00	
	823°		*400*
2287°		2·00	

We see at once, then, the possibilities of increased efficiencies, and our purpose is, therefore, to produce the hot flame necessary. The well-known Graetzin burner accomplished this with low-pressure gas to a large degree by preheating the secondary air by means of an inner chimney and enclosed globe; and some really splendid results have thus been obtained. Then both primary and secondary air were preheated; and I think in this connection (as perhaps also in many others) Mr. George Helps, of Nuneaton, ought to have more credit than is generally accorded him. The next step was the raising of the initial gas-pressure. This enabled the gas and air to be more thoroughly mixed and to burn a much larger quantity of gas in a given area; and this has gradually resolved itself into the present 60-inch lighting systems.

While in an ordinary universal low-pressure mantle some 3½ feet are consumed with a mantle area of 7 sq. in., 3½ feet are consumed in a mantle area of 3½ sq. in. in a 60-inch pressure flame. The gain in flame temperature is at once apparent. I think that Mr. Onslow (then of Woolwich Arsenal) was the first to employ these high pressures to lighting with an upright burner; and I am proud to think we were associated with him in those early days. Then came the inverted high-pressure burner; and I have not yet been able to find out whether Messrs. Keith in this country, or Messrs. Ehrich and Graetz, of Berlin, were really first in the field. But, as in many other cases of inventions, two or more firms were probably working on the same lines at the same time.

In the high-pressure lamp, attention has been mainly devoted to thoroughly mixing the gas and air and preheating the mixture, but the heat at the mantle has until lately prevented the successful application of the Graetzin principle. [The glass at once either cracks or melts.] We have for the last two or three years been experimenting in this line with inner chimneys made of silica; and only the great pressure of other business has prevented our introducing the use of "Vitrosel" very largely for this purpose. Other firms, we understand, are now advocating its use; and no doubt it will become very general before long, especially if it can be produced a little clearer and thinner. The Thermal Syndicate, Limited, claim that, though their chimneys are somewhat opaque, there is an increased efficiency of some 10 per cent. over a glass chimney, as it can be placed nearer the mantle.

Having been lately appointed British Consulting Engineer to Messrs. Ehrich and Graetz, the makers of the Graetzin burner, I suggested to them that a series of experiments should be made with respect to the increased efficiency of lamps with preheated air supply, and also as to the actual pressures inside the bunsen tube, as this question has often been put to me. With a willingness that only comes from a firm well-equipped scientifically, and realizing the importance of scientific data, they immediately made the experiments; and almost before I got home from Berlin, the data especially obtained by Dr. Fischer, their Technical Director, was ready, and is here before you—see fig. 1.

The gain in efficiency is astonishing at first glance; but an examination of Mr. Evans' table shows us that a rise in temperature of 110° will give the desired result. I have not yet had time to verify the increase in flame temperature and compare it with Mr. Evans' table, but hope to do so at a later date with the assistance of my fellow member, Mr. Buckley, who has been kindly given the necessary permission by Mr. Newbigging. This class of investigation, however, I think is one which the University might well undertake, together with the attempt to move that peak in the curve (also shown by Mr. Evans) a little nearer the visible end of the spectrum. There are in this University the two greatest authorities in the world on this subject. Professor Dixon on flame temperature, explosions, &c., and Professor Rutherford on radio activity. Cannot our seniors either enlist their sympathies or make it worth their while to devote some of their great ability to this admirable purpose? The present actual luminous efficiency is so small and the possibility of increase so great!

The pressures found in the bunsen tube, as shown on diagram 2, are so small that I thought it best to repeat the experiment before you, as it might be considered to require too much faith in my veracity to accept it. Pressure at the nipple 600-10ths, at the nozzle only 3-10ths, so that any preconceived idea of great pressure at the point of combustion must at once be abandoned. The question of rate of flow, however, is quite another matter. In this burner the actual rate issuing from the nozzle is 13 lineal feet per second, while in an ordinary universal burner it is only 4 feet per second.

Experiments with High and Low Pressure Burners.

While we have this bunsen burning, we will vary the quantity of air mixed with the gas and change the character of the flame from yellow tipped, through the ordinary low-pressure flame to the high-pressure flame and beyond where the extra air only

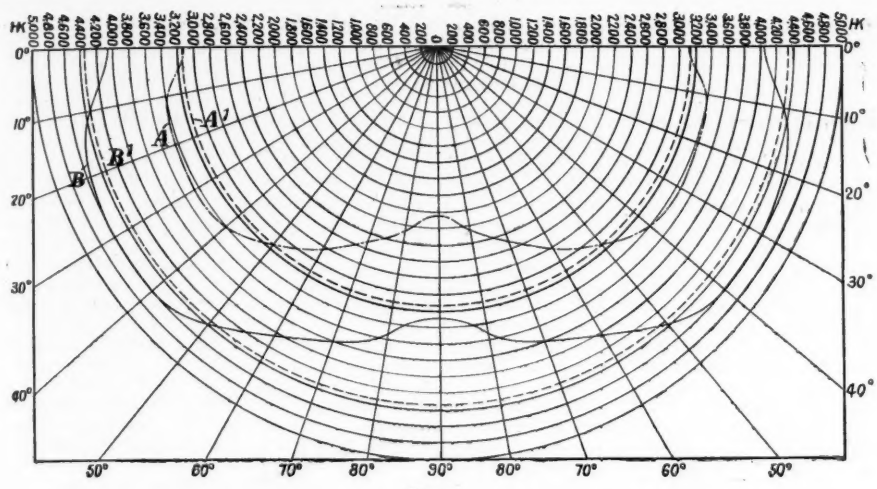


Fig. 1.

A.A'—Without preheated air. B.B'—With preheated air supply.

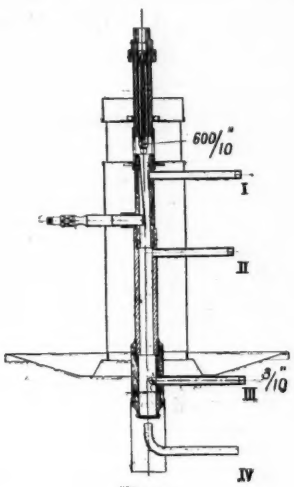


Fig. 2.

acts as a diluent and cools the flame. You will notice the point previously alluded to—viz., that the poorer the flame (*i.e.*, the flame insufficiently supplied with oxygen), the larger the area of the flame and necessarily less heat at any point. As more air is added, the flame area becomes less with an increase of flame temperature, as double the area, even if at the same temperature, means only double light, whereas a slight rise in temperature alone means greatly increased light.

Having now obtained our flame, we will leave it for the present for the mantle manufacturer to fit a mantle to it so as to obtain the full value. This is an important necessity. I will put on a silk mantle which fits fairly well; and I think even our electrical friends will admit it is a pretty good light. While on this point, I am pleased to say we have just fitted the Manchester Royal Exchange with ten of these lamps and two three-mantle lamps; and the Master informed me a week ago to-day that, although only originally intended as a stand-by in case of failure of electric arc lamps, he himself and many members of the Exchange so much prefer the quantity and quality of the gaslight, that in future gas is to be the regular illuminant and the electric arcs the stand-by. This is welcome, especially at the moment.

The principle of using air at a pressure and inducing gas is one that has many advocates, and there is no doubt that it enables a thorough mixing to take place, as there is a considerable volume of air at a pressure available for drawing in a small quantity of gas, whereas in the compressed gas system there is a small quantity of gas to draw in a large volume of air.

It is claimed that air at 1 lb. pressure is equal in efficiency to gas at 12 lbs. pressure, for the reason mentioned above. The final flame result is much the same in both cases; and the choice of system is largely a matter of individual taste or expediency. The two systems were thoroughly tested in Berlin, and particulars published in the Technical Press at the time. The fact that most of the extension of gas lighting has been in the direction of high-pressure gas certainly carries weight in the direction of high-pressure gas.

Mixing of Gas and Air Under Pressure.

We now come to the mixing of gas and air both under pressure. It is here we have had most of the innovations of late; and I may as well confess that this is the part of the subject that interests me most at the moment.

Mixing gas and air has long been an everyday process for heating purposes; but until the introduction of the incandescent mantle, it was not considered of advantage to add air to gas for illuminating purposes. When, however, acetylene was introduced on a fairly large scale for lighting, it was found that the gas was so rich in hydrocarbons that a much larger quantity of air was required to consume it completely than was the case with coal gas, and the ordinary burners were useless. It was necessary, therefore, either to burn the gas in the form of a luminous bunsen flame, or to use a very fine-holed union-jet from which the gas issued at a sufficient velocity to obtain the necessary air. This difficulty caused us to design an apparatus and take out a patent, in 1896, for adding and mixing a definite quantity of air with the acetylene at the meter, so that it could be burned in ordinary Bray burners. Mr. Marsh—who has been connected with most new departures in the gas industry—had the West End Pier at Morecambe lighted by this means for a whole season. I have made a copy of the patent drawing to show the principle used; and it is interesting to note how history repeats itself, as I saw a description of a similar apparatus re-invented the other day.

The system known as the "Selas" mixes about two parts of air to one of gas at the compressor. This mixture is sent into the pipes, and induces the air necessary to complete combustion at the burner. This enables an excellent mixture to be produced, and very good results can thus be obtained with only a medium pressure in the pipes (approximately 10 inches of water). There is now also the "Bonecourt" system of surface combustion, which mixes all the gas and air necessary for complete combustion and burns it in the interstices of a granulated material, producing a remarkable heat in a small area. This has, however, been so fully described in the Press that it is only necessary to mention it here in passing.

Now in all systems where either the whole or a proportion of the air required is drawn in at the burner, there is the difficulty of fluff and dirt to be contended with; and in some positions it is a very serious trouble. The discovery of difficulties, however, should lead to methods of surmounting them. In one cotton mill the trouble was so great that Mr. Halliwell, of Littleborough, suggested we should try something different from what was usual. We therefore decided to mix all the gas and air at the compressors, and burn the mixture at the end of the pipes. No air was taken at the burner, and the several hundred lights have been in use for three years at this mill to every one's satisfaction.

We have not yet placed this system on the market, as it was such a departure from the usual practice that we wished to have a thorough test, and also because about this time I was in communication with the Preston Gas Company in regard to lighting their works. It was a curious coincidence that Mr. Heald, our Vice-President, suggested this very idea for use in gas-works, where coal dust is a constant source of trouble; and it is in the form eventually decided upon in collaboration with Mr. Heald that we intend to place it on the market now that it has been working, I believe, almost continuously day and night at Preston for two years. I should like here to acknowledge Mr. Tagg's great kindness and courtesy, not only in allowing us to make our experiments, but also for suggestions from time to time.

You will see we have simply a nozzle at the end of a pipe, and that the flame is a perfect one. The great advantage of this arrangement, apart from the cleanliness and freedom from dust and dirt troubles, is the extreme simplicity of the burner, and the fact that the mixture is the same in all the burners. No individual adjustment is necessary; and if the composition of the gas varies so as to alter the character of the flame, a simple turn of a screw at the compressors puts all the lamps right at once. We have not yet applied it, but we have arranged for the necessary adjustment to be made automatically according to the flame temperature, if ever this is thought necessary. Although we have not experienced any necessity for so doing, it is thought advisable to put a gauge at each tap to prevent explosion in the pipe.

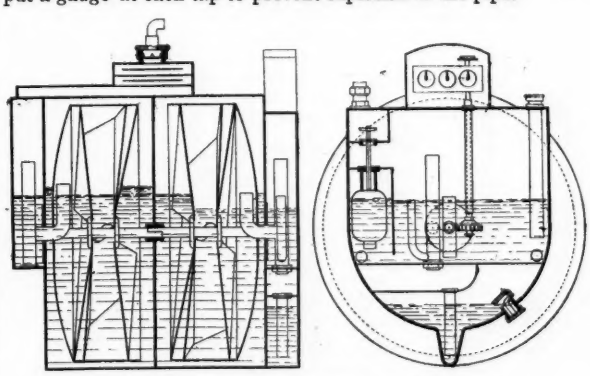


Fig. 3—Thorp's Gas and Air Mixer—Patented 1896.

My business brings me in constant contact first with one engineer and then another; and it was my good fortune to be favoured with an interview with a gentleman bearing an honoured name in the gas industry (I refer to Mr. John Newbigging, of Manchester) about the time of the Manchester lighting tests. In the conversation it was suggested that a high-pressure gas-lamp, simple in

construction, efficient, and of such a character that it could be cleaned by an ordinary labourer and reassembled without requiring any special knowledge of adjusting, was a necessity. We went carefully into the matter; and the burner I have here is the result. It is in appearance and construction very like the B.S.T. type of Graetzin high-pressure burner; but there is no air adjustment provided, as every lamp is standardized, and can be taken to pieces and put together again without disturbing the adjustment in the least.

Mr. George Helps has often discussed with me the advisability of adding a little air to the gas in the mains, to get better results with incandescent burners; but I do not know of anyone having done this. While not actually doing this in the general mains, Mr. Newbigging and ourselves propose to standardize the lamps with a very small quantity of air added to the gas—so small, however, as not to affect the gas in a general way. This small amount of air we propose to add at the compressors, and in such a way that the percentage is the same, no matter the quantity being used. The lamps will, therefore, either be all good, bad, or indifferent as the case may be, and by a slight adjustment at the compressor—*i.e.*, by varying slightly the proportion of air added—the whole of the lamps can be instantly brought up to concert-pitch. This we think an ideal system; and we hope soon to have an installation working for Mr. Newbigging's observation.

Before leaving the question of lighting and proceeding to that of heating, I should like to mention a further application of what I may call the "Heald" or "Preston" burner. I have not quite led up to this point yet, but I think it is best mentioned here. I have constructed a small lamp for the burning of the gas and air mixture, of such a character that no secondary or primary air is taken from the atmosphere surrounding the lamp. The globe (quartz) is quite air-tight, so that no air gets in. This keeps not only the burner, but the globe quite clean, even in the worst condition possible. The construction is very simple, as you will see. The gas and air are mixed and burned at the end of the tube, while the secondary air is led in from the special air-pipe, and the products escape up a separate tube. The lamp burns with a beautiful light; and if the globe does not crack, we shall, I think, have the satisfaction of seeing for the first time an incandescent lamp burning entirely under water. By altering the proportion of air and gas in the bunsen flame, the secondary air is unnecessary. I am not suggesting this as a method to be generally adopted for domestic lighting, as, although I can imagine many of you considering its use for lighting the room and at the same time boiling the water for breakfast, there may possibly be some disadvantages. Joking apart, this experiment leads us to consider a very important application of this principle, and we shall return to it shortly.

The principle of mixing gas and air has been adopted with great success for many industrial purposes, and can usually be advantageously employed wherever a bunsen flame is required.

For the gassing of yarn—silk, cotton, or woollen—our apparatus has met with great success, and many thousands of burners are in everyday use, not only in this country, but also abroad; and Messrs. Asa Lees, of Oldham, one of the largest gassing frame makers in the world, have adopted this system exclusively for the machines they manufacture. The advantages of this method of gassing are many; but the main features are economy in gas consumption, regularity of gassing due to constant flame composition and size, and freedom from troubles caused by fluff and dirt affecting the burners of the bunsen type. It is advisable in all cases where new principles of this kind are introduced to make your burner to suit the new conditions. I have here a number of gassing burners of different kinds; but we find the ones shown burning to give the best results.

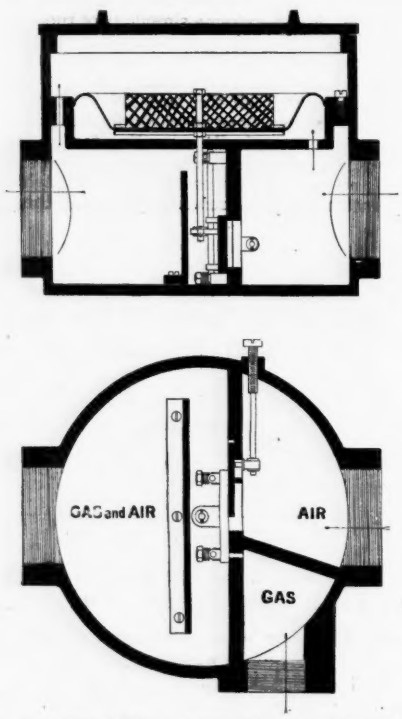


Fig. 4—Sectional Plan and Elevation of the Mixing and Governing Valve.

It will be readily understood that this apparatus can be used for all purposes where a regular, steady, and perfect bunsen flame is required, such as the singeing of cloth, &c. [A special bunsen burner was here shown by Mr. Thorp.] If, however, we try to burn this excellent flame under a copper singeing bowl, the flame at once becomes bad. This is due to the products of combustion not being able to escape properly, and the flames being unable to get the necessary secondary air for their complete combustion.

It will be noticed in the experiment I will now conduct that at first the flame will be bad; but immediately the air-tap is turned on, the flame again becomes perfect. This improvement is due to supplying the extra air necessary to complete combustion and sweep away the products. This difficulty solved, our next problem was to burn a large volume of gas in a confined space; and the concluding part of my paper dealing with this subject is perhaps the most interesting, as it certainly is the most novel.

I will now pass the burner before mentioned into a bowl enclosed at one end. It is at once extinguished. By turning on the extra air as before, the flame remains alight; and this flame can be turned high or low according to requirements without the character of the flame altering. This burner and apparatus are being introduced with great success for the heating of calender bowls, and have been adopted by many firms, including the Calico Printers Association and the Bradford Dyers Association.

The problem was not an easy one when you realize that about 200 cubic feet of gas per hour are to be consumed properly in a 4-inch hole bored out of a mass of iron about 16 inches diameter and 7 feet long, with only one end open to atmosphere.

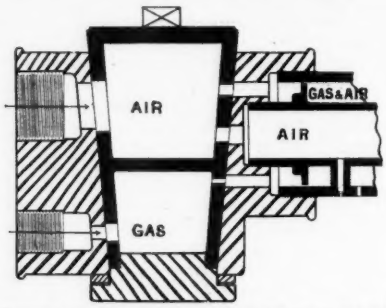


Fig. 5—Burner and Tap for Controlling the Gas and Air Mixture and Extra Air.

If now the gas is burned in a thin walled tube, the tube will very quickly get hot, radiate its heat, and send away the products at a high temperature. Mr. Bloor, of Carlisle, having seen this experiment, suggested that the principle might be applied to the heating of buildings, rooms, ovens, &c., instead of using steam-pipes or hot water.

The products from an arrangement of this kind are necessarily very hot; and by leading them through pipes, the heat can be absorbed by the pipes and thus given to the room. The tube containing the burner could be lagged if necessary, so as to give a more general heat, principally at the burner. The products issuing from the end of the pipe are practically cold, so that it is evident all the units of heat have been utilized.

You will now have seen where the experiment of burning the light under water led us to, as that was completely burning gas in a confined space.

Heating Water or Raising Steam.

We now come to the application of this system to heating water or raising steam. What is desired is to get all the heat units into the water; and if we completely burn the gas and get the products away cold, I think you will admit we have achieved our object.

In the following experiment, I am again using our special burner with extra air, as well as a mixture of gas and air. Cold water is passed in at one end, and hot water withdrawn at the other. I can assure you the gas is completely burned; and you will see that the products are practically cold. I have no doubt many applications of this system have suggested themselves to you as they have to ourselves; but I must content myself with dealing with only one more this afternoon, and that is the adaptation of a gas-fire. At the moment this is not developed sufficiently for general household use; but I believe its use for large houses, flats, and hotels will be at once realized.

Adaptation of the System to a Gas-Fire.

You will understand that the fire shown is only a model to show the principle, and not an actual fire. Many are the objections to gas-fires; and we set ourselves a somewhat difficult problem.

1.—There is, of course, the question of economy. On this point, you have already seen there are means of getting all the heat out of the gas instead of sending a portion up the

chimney. But Mr. Bond, of Southport, who is kindly associating himself with us in the testing, &c., of this fire, laid it down as an axiom that we must get the heat as high-temperature radiation and low-temperature convection. You have already seen how the low-temperature convection can be obtained by passing the products through pipes to abstract the heat; and we get the high-temperature radiation by causing the very intense flame to play direct on to a thin half-tube of silica, which gets red-hot and radiates the heat imparted to it. The whole apparatus is sealed, and the products pass away and issue practically cold.

2.—The ordinary fire has the disadvantage of smell when first lit. This cannot happen here, as the apparatus is self-contained, and hermetically sealed.

3.—The usual difficulty of down-draught and products coming into the room is entirely removed, as the products can be either carried into the flue (which has no connection with the room) or else led away in a pipe to the outside of building. [I have placed the end of the outlet into water, to allow the products to pass away through a seal. This conclusively proves that no further troubles will be experienced from down-draughts, &c.]

4.—Two very important points can here be joined together—viz., danger from asphyxiation and explosion.

Under this system they are impossible, as the tap turning on the gas automatically turns on the air; and as the air is always in sufficient excess of the gas (without taking into account the further dilution of the mixture by the air in the room) to prevent explosion, troubles under this head are absolutely avoided.

There are many points I have left untouched; but I trust that, though the lecture has not been quite so academic as the associations of this room really demand, it has not been without interest.

OIL FOR NAPHTHALENE EXTRACTION.

The following is an abstract translation of a communication published in the number of "Wasser und Gas" for Feb. 15, on "Oil for Naphthalene Extraction by Washing," by Herr W. Schweizer, the Chief Works' Assistant at the Düsseldorf Corporation Gas-Works.

The troublesome obstructions caused by naphthalene are due to the fact that it becomes solid at temperatures below 176° Fahr. Two methods have been practically applied for removing naphthalene from the gas, and thus preventing obstructions—viz., (1) suitable condensation, (2) washing the gas with tar oils.

Regarding the first method, the view is widely held that the gas must be cooled slowly in order to retain the tar fog as long as possible. But numerous experiments have convinced the author that rapid condensation is better. For instance, with slow cooling, the gas was found to contain 6·5 to 11 grains of naphthalene per 100 cubic feet; whereas with rapid cooling, but with other conditions the same as before, the gas contained only 0·9 to 2·2 grains per 100 cubic feet. The work thrown upon the naphthalene washers was thus greatly reduced.

As to the second method, naphthalene left in the gas after condensation is extracted by washing with oil. Various oils are offered for the purpose; but some oils sold as naphthalene washing oils actually give up naphthalene to gas, instead of removing it. Hence oils should be examined before use. The necessary examination may be made in the following manner: A separating funnel is filled with the oil, which is left in it for eight to ten hours, in order that the water may separate out. Then 100 c.c. of the oil is poured from a measuring cylinder—about 2 c.c. being allowed for the oil which clings to the walls of the cylinder—into a 500 c.c. fractionating flask. Half-a-spoonful of powdered pumice is added and shaken up with the oil, in order to prevent bumping during boiling. A thermometer, graduated from 0° to 360° C., is fitted through a cork in the neck of the flask, so that the bulb is opposite the side arm. The flask is heated on a sand bath, and the distillate up to 120° C. is collected in a 50 c.c. graduated measure. The distillation is continued; and two further fractions of distillate—viz., from 120° to 200° C., and from 200° to 270°—are collected separately. The flask is protected from draughts during distillation by means of asbestos board, and the rate is controlled to about one drop of distillate per second. The volume of each of the three fractions is observed; and they are then cooled to 0° C., whereupon any naphthalene in the oil will settle out in the form of white crystals.

Analyses of New and Spent Washing Oils.

Sample of Oil.	Specific Gravity at 15° C.	Fractionation.			Observations.
		Below 120° C.	120° to 200° C.	200° to 270° C.	
		Per Cent.	Per Cent.	Per Cent.	
No. 1 Before use	1·108	0·00	6·13	6·05	No deposition of naphthalene on cooling.
After use	1·080	1·13	13·42	31·80	Ample " " " " "
No. 2 Before use	1·114	2·95	3·90	5·25	No deposition of naphthalene on cooling.
After use	1·085	4·52	9·30	19·80	Ample " " " " "
No. 3 Before use	1·031	2·25	23·65	49·0	Much naphthalene deposited at ordinary temperature.
After use	1·065	4·58	8·40	30·2	" " " " "

In order to ascertain whether oil which is free from naphthalene has a high absorptive capacity for naphthalene, gas enriched with naphthalene is passed at the rate of from 0·7 to 0·9 cubic foot per hour through 100 to 200 c.c. of the oil, and then through a solution of picric acid. If the absorptive capacity of the oil is low, cloudiness, followed by a white precipitate, will appear in the solution of picric acid within ten to thirty minutes. On the other hand, with oil of good absorptive capacity, the cloudiness and precipitate will not appear for a long time—even a few days. It is usually only necessary to make such an examination of oils of low specific gravity, from which no naphthalene has deposited on fractionation.

Control of the oil in use is a very simple matter. The specific gravity of the oil decreases as the proportion of naphthalene in it increases. The specific gravity of the oil before use is determined at 60° Fahr. by means of a hydrometer, and then 100 to 150 c.c. of the oil is saturated with naphthalene by passing gas rich in naphthalene through it until the escaping gas causes a precipitate in a saturated solution of picric acid. Gas can be enriched with naphthalene for the purpose of this test by passing it in series through two glass towers packed with commercial naphthalene. The specific gravity of the saturated oil at 60° Fahr. is ascertained. If it is found to be (say) 1·070, it is advisable to run off the oil from the washer as soon as it reaches a specific gravity of 1·075 or 1·080. The specific gravity of the oil in use thus affords a simple means of controlling the working of the naphthalene washer.

The author proceeds to give analyses of a number of oils before and after use in the naphthalene washer. The more significant particulars of them are quoted in the appended table. Oils No. 1 and 2 in the table are good washing agents, though both extract some benzol from the gas. Oil No. 3 is useless for the extraction of naphthalene, and in use actually gives up naphthalene to the gas passing through the washer. Generally speaking, the author considers that oils of low specific gravity are likely to contain considerable quantities of naphthalene. If, on fractionation, an oil of low specific gravity is found to be free from, or to contain but little, naphthalene, it is probable that it will be found to have a very low absorptive capacity for naphthalene, and on that account to be of little value for use in the naphthalene washers.

The Home Office and the Ilkeston Disaster.

Sir Edward Troup, K.C.B., the Permanent Under-Secretary for the Home Department, has issued, by direction of the Home Secretary, a circular to gas undertakings, calling their attention to the report of Mr. A. G. Drury, M.Inst.C.E., on the Ilkeston gasholder disaster, given in the "JOURNAL" for the 25th ult. (p. 814), and suggesting that the recommendations he makes should be considered with a view to preventing similar accidents in future. Sir Edward remarks:

> Although Mr. Drury is unable to state definitely the immediate cause of the disaster, he holds that the steel tank was too light in construction; and he expresses the opinion that, while there is no cause to condemn the use of steel tanks above ground, even of the spiral-guided type, provided they are properly designed, constructed, and maintained, care should be taken to ensure that they are sufficiently strong not only to meet ordinary working conditions, but also to meet such contingencies as the jamming or premature telescoping of lifts, which experience has shown are liable to occur. Mr. Drury makes specific recommendations as to the precautions which should be adopted in regard to the choice of material, the factor of safety, and design; and he lays stress on the desirability of a skilled engineer being in all cases employed by local authorities and other bodies proposing to erect gasholders, to advise them in the choice of the best design from those submitted by competing firms.

MANCHESTER JUNIOR GAS ASSOCIATION.

Annual Meeting.

The Fourteenth Annual Meeting of the Manchester and District Junior Gas Association was held at the Exchange Hotel, Manchester, on Saturday afternoon; about forty members being present.

Mr. D. V. Hollingworth (Birchenwood), the outgoing President, occupied the chair at the commencement of the proceedings.

The Hon. Secretary (Mr. J. Alsop) read the minutes of the last annual meeting, held in Manchester on April 20, 1912; and, on the proposition of Mr. R. H. Garlick (Salford), seconded by Mr. H. Butterworth (Blackley), they were certified as a true record of the proceedings.

Annual Report of the Council.

The Hon. Secretary next submitted the annual report of the Council. It showed that the number of members on April 20, 1912, was 150. During the past year fourteen new members had been enrolled, or five less than in 1911-12. But six had resigned, a like number had been struck off the list, and two had died; so the total membership was unaltered. The Council announced that the volume of "Joint Transactions," which they said was of great value to the members, had been again ordered. Reference was made to the papers read and the visits paid during the year; and the thanks of the Association were given to the readers of the communications and to the engineers and committees who had facilitated the visits. Special mention was made of the joint meeting with the Yorkshire Junior Association at Sheffield, when the members had an opportunity for the first time of inspecting a battery of Koppers coke-ovens at the Thorncliffe Iron-Works of Messrs. Newton, Chambers, and Co., Limited. In conjunction with the Senate of the Victoria University and the Manchester District Institution of Gas Engineers, four lectures were delivered during the year. The Council expressed the indebtedness of the Association to the Vice-Chancellors (Dr. Hopkinson) and Professor Harold B. Dixon, F.R.S., for assistance in arranging the lectures; to the Senate of the University, for their generous contribution to the funds of the education scheme; to the Manchester District Institution of Gas Engineers, for their interest in, and support of, the scheme; and to the Technical Press and the Council of the Institution of Gas Engineers, for "their kindly recognition of the promoters' efforts." The Council much regretted that it had been impossible to arrange for evening lectures at the University this year; the number of entries not having been sufficient to warrant a continuance of the scheme. The Council closed their report by placing on record an expression of the thanks of the Association to Mr. J. Alsop, for the efficient manner in which he had carried out the duties of Hon. Secretary, the appreciation by the members of his services, and the general regret felt at his resignation.

The President said he trusted the labours of the Council had been satisfactory to the members. In moving that the report be adopted, he remarked that the Council had worked very loyally together; and when the members took into consideration the programme of the session, he was sure they would be impressed with the quality of the fare presented for their approval. There was no doubt that the older the Association grew, the more onerous became the duties of those whom the members elected to represent them. Being upon the Council was by no means a sinecure. The position involved a good deal of time and work for the Association, besides a great deal of expense. He was sure members of the Council deserved hearty thanks for their labours.

Mr. W. L. Heald (Preston), who seconded the motion, said it was regrettable that there was no increase in membership to record. With regard to the work of the session, he urged members to come forward voluntarily with offers of papers. If more of the voluntary spirit prevailed, it would afford much pleasure to the Council. The work of the Joint Council did not come before the members' notice to any considerable extent; but he could assure them that much valuable work was accomplished. He greatly regretted, however, that the mid-weekly evening lectures at the Manchester University had been dropped for this year. There was still a possibility of making arrangements for their continuance; but the matter was entirely one for the members themselves. Those who had attended the lectures with regularity knew how helpful they were.

The report was unanimously adopted.

The Accounts.

The Hon. Treasurer (Mr. J. Robinson, of Altrincham) presented the balance-sheet for the year ending March 31 last, and briefly moved its adoption. It showed that the income for the year was £52 2s. 4d., and the expenditure £50 0s. 2d.; leaving a balance of £2 2s. 2d.

Mr. T. W. Smith (Heywood) seconded the motion, and the statement was unanimously passed.

Election of Officers.

Before proceeding to the appointment of officers for the year ensuing, Messrs. H. Butterworth (Blackley) and J. H. Massey (Oldham) were chosen as Scrutineers.

Mr. J. M'Nicholl (Warrington), nominated by the Council, was elected Junior Vice-President.

In returning thanks, Mr. M'Nicholl assured the members that he was deeply sensible of the honour they had conferred upon him. He said his object would always be to keep as near as possible to the high standard which had been set by his predecessors.

On the proposition of Mr. A. Cummings (Oldham), seconded by Mr. J. Alsop (Stockport), Mr. James Bridge, of Stretford, was unanimously elected Hon. Secretary in succession to the last-named gentleman.

Mr. Bridge thanked the members for their unanimous vote. He said he was pleased their choice had fallen upon him, because his Chief, Mr. H. Kendrick, had been the Hon. Secretary of the Senior Association for many years, and nothing afforded him greater pleasure than to endeavour to follow in Mr. Kendrick's footsteps. He concluded by paying a tribute to the work of Mr. Alsop, and remarked that if all the members possessed as much enthusiasm as he did, there would have been no necessity to abandon the mid-weekly University lectures.

Mr. J. Robinson was unanimously re-elected Hon. Treasurer; and Mr. J. H. Massey (Oldham) was appointed Auditor; the retiring Auditor, Mr. J. Wareham (Manchester), who was nominated by the Council, withdrawing his candidature on the ground that he thought the honours of office should be distributed a little more.

Value of the "Transactions."

Mr. F. H. G. Goodwin, B.Sc. (Salford), proposed a hearty vote of thanks to the members of the Council for their services during the year. Their President had already indicated that the work of the session had been particularly onerous. The members deeply appreciated the Council's services in many ways in general, but in one way in particular. He referred to that useful publication entitled the "Transactions." Speaking for himself, whenever he wanted to look up the latest information on the hundred-and-one-things a gas engineer had to deal with—from high-pressure distribution to the designing of gas-works plant—he invariably turned to the bound volumes of the "Transactions," which were veritable "mines of information." The printed records showed clearly that a vast amount of work had been accomplished. This work was initiated and inaugurated by the Council, to whom he had the greatest pleasure in proposing a cordial vote of thanks.

Mr. J. W. Nichol (Radcliffe), in seconding the motion, expressed regret that the membership of the Association remained practically stationary. He did not know why this was so; but he urged upon the members generally to endeavour to increase the membership. He was glad to hear that there was a possibility of the mid-weekly University lectures being resumed, as they were undoubtedly of great value, and helped them to "fight the fight they had to fight." Referring to the "Transactions," Mr. Nichol said he agreed very cordially with all that Mr. Goodwin had said about their utility. The lectures were appreciated by many of the members, and the "Transactions" were prized for future reference. He did not know whether he would be in order, at this juncture, in urging anything as to future policy. Their President-Elect had already thrown out several useful hints. There was one matter, however, which he (Mr. Nichol) would like the Council to take cognizance of—viz., representation on the Committee for the Education of Gas-Fitters. The members of the Junior Associations were constantly dealing with gas-fitters, and knew their requirements.

Mr. A. L. Holton (Manchester), who replied on behalf of the Council, said they had never before received from members such expressions of appreciation as had been showered on them that day. As an Honorary Secretary of the Joint Council, it was pleasing to hear the remarks of the members about the "Transactions." To find that they were so much appreciated by the members was very helpful. Mr. Nichol had raised the question of members of their Joint Council being represented on the Committee for the Education of Gas-Fitters; but this matter had gone past the Joint Council to the Institution of Gas Engineers.

The balloting for five new members of the Council resulted in the election of Messrs. J. Alsop (Stockport), A. L. Holton (Manchester), C. E. Woodhead (Manchester), F. H. G. Goodwin (Salford), and F. Dean (Altrincham). These gentlemen, with Messrs. S. Carter (Garston), W. C. Cummings (Manchester), and A. Hodgson (Ashton-under-Lyne), constitute the new Council.

Introduction of the New President.

Mr. Hollingworth said that, in introducing the new President (Mr. W. L. Heald), he had a most pleasant duty to perform. Alluding to his own tenure of office, he said he did not think, having regard to all circumstances, that he had carried out the presidential duties as some of the members might have wished—certainly not as he himself would have wished. When he was elected Junior Vice-President, he was engaged at Salford, and his transference to Birchenwood had, perhaps, placed him in a region separated, to some extent, from the "seat of government in Manchester." As their Senior Vice-President, however, he would still continue to take a deep interest in the proceedings of the Association. He assured the members the Council were working with a complete unanimity of purpose for the benefit of the Association, and undoubtedly did more good work than perhaps some members thought. The publication of the "Transactions," which had been so well spoken of, was tangible evidence of what

they could do. In Mr. Heald, as President, he was positive they had chosen a man of character and qualification, who would be a bright ornament to the Association, and one who would more than uphold its condition and status.

Mr. HEALD, in reply, said he hoped that he would prove, during the next twelve months, that he was something more than a "bright ornament," as Mr. Hollingworth had said. What he wanted to see accomplished was practical progress. He thought Mr. Hollingworth deserved the hearty thanks of the Association for the work he had done during the past twelve months; and he moved to this effect.

Mr. S. CARTER (Garston), in seconding the motion, said he was deeply sensible of the manner in which Mr. Hollingworth had carried out his duties.

Mr. Heald's name was afterwards formally put to the meeting, and his election to the office of President was carried by hearty acclamation.

Mr. HOLLINGWORTH, in briefly returning thanks, said he hoped the members would consider he had always endeavoured to do his best for the enhancement of the industry.

PRESIDENTIAL ADDRESS.

Let me thank you for the honour the position I now take up gives, and let me also thank you for the work and experience it promises to give. I intend to confine my remarks to matters which the Association closely engages in, and to address them chiefly to the younger and newer members. When a youth enters a profession like our own, which has several sides or departments, he will give more thought to the side to which his natural bent leans, and more or less neglect the others. If this is allowed to occur, the tendency is that his views and breadth of mind become narrowed—in short, he gets into that rut which he can get out of only by his own efforts.

Now there are five objects mentioned in our book of rules which the Association strives to attain; and I think this matter comes under the first four words of the first object—"Promote the General Welfare." Let me put it to you that a man who writes a paper on any subject, occasionally proposes a vote of thanks, takes part in our discussions, and interests himself in the work of the Association, will have received such a training as no Technical School can give him. I am quite sure that the writer of a paper gains far more knowledge than he who listens to the subject matter. He will have looked into details which in the ordinary course of events he would never dream of. The man who takes part in discussions will, with practice, put concisely and in sequence into words his thoughts and knowledge. By taking part in the Association work, a little insight into organizing and business may be attained—an insight which many of us, as Juniors, do not gain in our daily work. I put this before you as a point which many members do not seem to fully realize as being a benefit of membership.

If you glance down the remaining list of objects the Association attempts to achieve, you must admit that they are fulfilled. Lectures are provided, papers are read and discussed, conferences and meetings are held, records of our doings and other similar organizations are published, and visits to works are arranged. A library has been formed; and I regret that more use is not made of it. But do these things extend the knowledge of the members? Primarily, we are an educational Association; but we must not forget that the social side of our meetings has more than a little to do with our education. Recreation is necessary to the maintenance of health, and many forms of it stimulate not only our bodies but our minds. I put it to you that the Association provides recreation in the sense that our frequent meetings take us away from our daily tasks, and give our minds fresh food for thought. We have pleasure in looking forward to them, and we have pleasure in looking back on them. Every meeting we hold has its social side, be it lecture or visit. Taking a lecture, it is the time before and after the lecture, during tea, and before and after the evening discussion. In my opinion, these periods are valuable, the exchange of general news, the expression of opinions on numberless items, and the ever-ready "What we do at ——," creates thoughts, helps those lacking in initiative, and heartens one man to try and do as well as his colleagues.

To those members who have been in the habit of going home or elsewhere immediately after a lecture, I strongly recommend the chance of the general intercourse which our meetings offer. I will give you a concrete instance. On taking up an appointment at Preston some three and a half years ago, my knowledge of the finer points in the manufacture of carburetted water gas was small; but with the kindly help of my Chief, and the very many pieces of advice from the several members of this Association who have made carburetted water gas a special study, I was able to possess myself of sufficient knowledge to attempt an improvement in the working of the plant under my care, until to-day, I am pleased to say, the results are 14 per cent. better than they were two and a half years ago. I can give several more instances of help received from members; but the foregoing should suffice to show that each of you who lacks particular experience can improve his knowledge by the very happy method of the interchange of advice with other members.

LAST YEAR'S PROGRAMME.

You all know the programme arranged for the session just ended. I trust it has been satisfactory to you all. The first lecture was delivered by Mr. E. J. Evans, B.Sc., on the "Radiation from Flames and the Welsbach Mantle." It seems to me that it was very appropriate this lecture should be the first of the session; for lighting by the incandescent mantle is the greatest source of revenue to a gas authority. The lecture was exhaustive; and Mr. Evans told us of theories, laws, and practicalities. Finally, after pointing out that the comparatively high efficiency of the Welsbach mantle was due to its radiating very selectively, he said that, if suitable bodies emitting luminescent radiation when introduced into a non-luminous bunsen flame could be obtained, it would be possible to get higher efficiency than we do at present. It appears to be a very difficult matter to obtain these bodies; but although we need not give up hope that suitable bodies may be adopted, at the same time we may look in other directions to obtain better efficiency with the present Welsbach mixture.

At present, we look to high-pressure lighting to give the best results. To my mind, high-pressure work has been handicapped for two reasons—the comparatively heavy cost of renewals, especially of glass, and the bulkiness and weight of the lamps. The James Keith and Blackman Company have recently introduced a lamp which greatly reduces both these complaints. I refer to the lamp in which no secondary air is required, and in which fused silica cups are used to cover the mantle. Of course silica cups absorb some light; but in spite of this, the makers claim that 10 per cent. increased efficiency is obtained over the older type of lamp. On the one hand, then, we have the possibility of the chemist finding us a more suitable mixture than the present Welsbach mixture, and, on the other, of the manufacturer making improvements in the burners themselves.

The second lecture was delivered by Mr. Franklin Thorp, on "The Mixing of Gas and Air for Heating and Lighting." I should like here to congratulate the author on being the first of our own members to lecture at the Manchester University, and, incidentally, to congratulate the Association on having as a member a University lecturer. I am very sure that what Mr. Thorp told us was deeply impressed on our minds by the admirable demonstration of lighting and heating he gave.

Personally, I am convinced that a large field is open for the use of gas and air mixture in the proportion of about one to five, not only as a source of heat for industrial purposes, such as the gassing of cloth and calender heating, but also in the lighting of all places containing a dusty atmosphere—the cotton factory, foundry moulding shop, and the retort-house, for example. There is no doubt that much unsatisfactory lighting is caused by the deposit of dust from the atmosphere on and in the burner, and the residue from the burnt dust on the inside of the mantle. A system which obviates the use of a nipple to draw in the required amount of air to completely burn the gas appears to be a means of overcoming some lighting difficulties.

In the matter of incandescent lighting, we have always looked upon oil as either a "back number" or one for the far future. Nevertheless, it is to-day not an unusual sight to see incandescent paraffin lamps in the open market places and outside shops. I believe the Commercial Section of the Manchester Senior Association has had this matter up for discussion; but I have no record of it. It is a fact, however, that in the South of England several railway stations are lit by this means. And at least one large railway company is satisfied, that, from an £ *s. d.* point of view, it is a serious rival system to gas. All of us will be well advised to have this system under notice, and be prepared to compete with it. In these times of nine-day wonders, we are apt to overlook the things which take time to develop, and gradually get accustomed to their presence; but we should remember that the man who gets in first blow usually does it to good effect.

The third lecture was delivered by Mr. W. R. Herring, M.Inst.C.E., on "General Observations upon the Construction of Gas-Works and their Equipment"—a lecture based on experience that older men than ourselves may well envy. We could not have wished to listen to or read words giving more solid advice and warning. Someone has said that this lecture formed a text-book of itself. I am quite sure that it will be consulted in the future by many men with profit, and give them the feeling of safety in following the advice contained therein. In connection with Mr. Herring's visit, I would like to point to his remarks after the lecture. He expressed the opinion that it was almost a pity the gas and electrical undertakings were not joined together as one body. In the future, the electrical people would see the advantage of joining the gas industry on account of the continued rise in the price of coal, &c. Then we should not find so many valuable products going up the chimney as was the case with the electrical people before they generated their current.

These remarks were uttered casually; but I afterwards found that they had revived in many minds this large question of the alliance of gas and electrical supplies. A few days after these remarks were made, there appeared in the "JOURNAL OF GAS LIGHTING," an article by Mr. C. H. Wordingham, M.Inst.C.E., the Electrical Adviser to the Admiralty, putting forward the alliance as a serious proposition. This is a question which has lain at the back of many minds for a considerable time; and in view of the fact that the Tottenham and Edmonton Gas Company are shortly to approach Parliament for powers to supply electricity to part of their district, there is a prospect that within our lifetime amalgamations will take place between existing separated authorities. In the South of England there are several companies which supply both gas and electricity; and only a couple of years ago a Lancashire man (perhaps more a gas man than an electrician) obtained a nice post as manager of a combined concern. I do

not wish you to understand that this Lancastrian deliberately educated himself with the idea of managing a joint undertaking; but I do put it to you that, at least in face of the possibilities, we shall not be wasting time in studying electrical affairs more closely than we do. So far as I can influence our doings in the coming sessions, electrical matters will take up part of the programme.

The last lecture, on the "Hygienic Aspects of Gas," by Principal Graham, M.A., is of such recent date as to be still fairly fresh in your minds. Principal Graham thought that the gas engineer had the matter of smoke abatement entirely in his hand. The enormous annual output of fires, cookers, and other gas appliances rather argues that gas authorities are doing their fair share towards keeping the atmosphere clear of soot, and this way they are overcoming the old fallacy of the pleasure of sitting round a bright coal fire. We can also look to the Bonecourt system of gaseous heating to reduce the black smoke nuisance. The results obtained at Skinninggrove on a boiler using coke-oven gas are certainly wonderful—evaporating 20 lbs. of water per square foot of heating surface and transmitting 90 per cent. of the net heat of combustion to the water are, on a large scale, without precedent. I do not think we may expect large factories to raise their steam by the surface combustion of coal gas, but rather by Mond or some form of producer gas. Water-heating systems and small steam raising plant, however, would probably come on to town gas.

I have made the foregoing remarks on the lectures to impress upon you that the gentlemen who arrange for them have chosen subjects very closely allied with the happenings and thoughts of the present time. They are lectures which should not only be listened to, but afterwards carefully studied.

VISITS.

There were three visits paid to gas-works—namely, Salford, Stockport, and St. Helens. Salford was brought forward from the previous year, just the same as Birchenwood is to be carried forward to the present one. There is no doubt that visits are popular with our members, especially those which take place in the early part of the session. But I often wonder if we take as much advantage of the opportunity of seeing what others do as we ought to.

OFFER OF PRIZES FOR REMARKS ON VISITS.

Those of you who visited Preston some two years ago will perhaps remember the remarks of my Chief, Mr. Tagg, and his suggestion that, after a visit, we should have a discussion or talk about any striking features we had seen. There is no doubt that such a course would be of benefit to us. There have been occasions when this might have been done, but certainly during the past year an opportunity has not presented itself; for after each visit we have had a paper, and shall possibly do so this year. Mr. Tagg now comes forward with an offer of two prizes for the two best sets of written remarks relative to visits. As a guide to what form these remarks shall take I will endeavour to give you a lead. Criticism is not required. From one to three features may be mentioned, but the number is quite optional, and one may gain as many marks as three. The remarks should be sent to our Secretary within fourteen days after the visit.

As examples, I would mention that at Stockport we saw a very well-arranged engine and meter house, with recording and other gauges off all portions of the plant under one man's observation. The advantages of this might well be discussed. At St. Helens, we saw that the waste gases from the setting heated the incoming coal, and the secondary air was heated by the outgoing coke—a system that has not been adapted to other forms of settings. Would not this also bring many thoughts to us worthy of (may I call it) self-discussion? This matter has yet to be accepted or rejected by your Council; but I sincerely trust they will see their way to accepting the kindly offer, believing as I do that some little good will accrue from it.

PAPERS OF THE SESSION.

We have had five papers presented to us for consideration. Mr. Feron spoke to us on "Carbonization;" Mr. Woodhead, on "Wet Purification;" myself, relative to "Charging Machines;" Mr. Goodwin, on "Town's Gas and the Development of Electrical Energy;" and Mr. R. B. Glover, on the "Construction and Working of the Glover-West Vertical Retort." With the exception of Mr. Woodhead's paper, each of them will appear in the "Transactions," and be there for reference. That they have proved a benefit to the writers I am quite certain, and can only hope that the knowledge and advice contained in them will prove of use to many of you. Our "Transactions" are now bound along with the "Transactions" of other junior organizations; and that they are of value to the members is proved by the fact that, in spite of the Council obtaining 10 per cent. more than were ordered by members, the whole have been disposed of, and that more are still required. To me this is a very pleasing feature of our work.

THE COMING YEAR.

Of the programme for the coming session, I can say little. It has, of course, not yet been arranged; but so far as I can see, it will take the same lines as last year. Already I am able to put before the Council the offers of three visits and two papers. It would be most gratifying if a few members would make really voluntary offers of papers. Usually a little persuasion is necessary; but this should not be so. Surely among 150 members connected with the Association, at least six should have the welfare of the Juniors sufficiently at heart to come forward and help in this respect. Each year also your President has asked for any suggestions that might be for our general good and further the objects of the Association; but, I believe, with little response. Nevertheless, I now ask you to consider any suggestions, and assure you that they would receive honest consideration by the Council.

UNIVERSITY LECTURE COURSE.

Recently you have had put before you a scheme for the continuance of the mid-week lecture course—to my mind, a most admirable scheme. Not only were you fully circularized, but many of you were verbally addressed on the subject. Notwithstanding a second circular, the number who condescended to reply to the invitation to join was only about 30, of whom 21 expressed their willingness to take up the course. On the face of this return, the Council very reluctantly decided to withdraw the scheme for the session. It is most discouraging work, as well as bad policy, to help those who will not help themselves; and until there comes from the members a strongly expressed wish that this higher educational branch of our work should again be brought forward, I shall not ask the Council to do anything with it. So far as could be seen, the drawback to these lectures was the cost to the members, and possibly the unsuitability of the lectures. It was proposed to eliminate almost entirely the first; and as regards the second, those joining would have had the opportunity of suggesting acceptable lectures.

JOINT COUNCIL WORK.

The work of the Joint Council of the English Junior Gas Associations does not come before your notice to any extent. It acts, one might say, as a clearing house for the four Junior Gas Associations, and discusses matters for their general good. The last yearly meeting was held at Sheffield. Many items were then brought up for discussion. In some cases a definite settlement was arrived at, and in others had to be deferred; but there were two matters which I should like to mention to you. One was the qualifications of membership to Junior Associations. For some little time your own Council have recognized the desirability of broadening the base of our rule No. 4, which gives qualifications to "persons engaged in, or studying for, any official position, and employed by a coal, oil, or water gas authority." This is not a rule common to all Junior Associations; and the Joint Council considered a universal rule would be an advantage all round. For instance, it is possible that a member of the Midland Junior Association who takes a post in this district of a similar nature to his last, and wishes to join us, may be ineligible under this rule, and still there is an understanding between the Associations that members may be transferred without seeking election.

While this matter is before the Joint Council, your own Council, though they have a broadened rule to put before you, consider it advisable to wait and see if this common rule is accepted. Our Council are prepared to accept the rule proposed; for although it does not quite meet our wishes, there is no outstanding reason why we should possibly be the ones to stop its adoption. It does broaden our basis of qualification. We shall be able to accept men such as technical assistants at coke-oven works, whose knowledge will be as useful to us as ours to them; and it will remove a barrier which has prevented many from joining us for the reason that they are for a period gaining experience with engineering firms. I point this matter out because you will, during the next twelve months, be asked to alter or retain the present rule. The other matter arose out of remarks in the Press on technical assistants' pay. After much discussion, the Council decided that it was not in their province to attempt to remedy any evil that existed, and that altogether it was a delicate matter. They recognized, however, that, while there were causes for complaint, the evil could not be called general.

In the editorial notes of the "Journal of Gas Lighting" on Jan. 2, 1912, it was suggested that the Joint Junior Council should memorialize the Council of the Institution of Gas Engineers on the matter, adding that it was a question that ought to interest the President. The Juniors did not take the advice, neither did the President take the hint. I do not see why he, individually, should. There have, of course, been many suggestions as to how to raise the present price of ability among Juniors. It is said that labour has its reward, and also that knowledge is power. If this is so, let us increase our knowledge of professional matters and technicalities, and by perseverance apply it for the benefit of the undertaking we serve. By so doing we must soon impress upon those over us the fact that we are becoming, or have become, practically indispensable to them. Surely there are few masters who would not recognize ability by a fair money return for it.

I cannot close these remarks without referring to the resignation of our Secretary, Mr. Alsop. You have had energetic Presidents, and you have had faithful Secretaries in the past; and, with all due respect to them, I say none has surpassed this gentleman in his endeavour to serve you truly and well.

I offer you no apology for this address. I have endeavoured to increase your interest in the work the Association attempts, to point out to you the fruit of its work and the advantage of it; and I ask you to join with me in making the coming session, if it is possible, more useful than any which have gone before it.

The remarks on the address were limited, owing to the many points raised at the afternoon meeting.

Mr. C. Berry (Hyde) said the address was just of the character

he expected from Mr. Heald. The members had not been ill-advised in electing him President. The speaker afterwards went on to refer to the discontinuance of the University Lectures. In his opinion they were most valuable, and one of the best points they had had for some time was that raised by Mr. Herring in regard to the study of electricity. They should study it more than some of them had done, because it was perfectly obvious that they could not fight a thing they knew nothing about.

A MEMBER suggested that many valuable and instructive papers might be obtained from the "trading members" of the Association. Their original papers emanated from this section—men who had practical knowledge of gas-plant manufacture. If they, as an Association, could bring back these men, and allow them to express their views, they would not be lacking in papers for discussion. The trading element should never, he considered, have been dispensed with. He hoped the Council would give consideration to this question.

After tea had been partaken of, it was announced that letters of regret for non-attendance had been received from a number of gentlemen.

PRESENTATION TO MR. ALSOP.

The Senior Vice-President (Mr. Hollingworth), during an enjoyable smoking concert, announced that he had yet one more engagement to fulfil, and one which gave him great pleasure. He had, in fact, a double duty to perform. The first was to propose

> That this meeting of members of the Manchester and District Junior Gas Association, hereby records its appreciation of the valuable services rendered to the Association by Mr. J. Alsop whilst Honorary Secretary.

There was no doubt that, as their guide and counsellor, Mr. Alsop had done everything it was possible for him to do. His unfailing courtesy, his remarkable enthusiasm, and his untiring energy had contributed, in his (Mr. Hollingworth's) opinion, more than anything else, during the last few years, to place their Association in the proud position of what he believed to be the premier Junior Gas Association. While the post of Secretary was a purely honorary one, it was not forgotten by the members that it involved extremely onerous duties. He was sure they would join with him that night in expressing to Mr. Alsop their hearty appreciation of his services. To the speaker, as the outgoing President, he had rendered the best possible service which could be given. In handing a handsome gold hunter watch to Mr. Alsop, the speaker concluded by expressing the hope that he would be long spared to wear it, and that it would remind him of the many occasions on which the members had enjoyed his company.

The inscription on the watch read:—

> Presented to Mr. J. Alsop by the members of the Manchester and District Junior Gas Association, as a mark of their esteem on his relinquishing the office of Honorary Secretary.
> April 5th, 1913.

Mr. ALSOP, who was accorded musical honours and enthusiastically cheered when he rose to acknowledge the gift, said it was not often he was embarrassed for words, but that night he felt somewhat in this position. He assured the members he would wear the token of their esteem with great pride, and hand it down to some member of his family as a mark of the respect the members bore him during his tenure of office. He had been Secretary of the Association for the last six sessions; and during this time he thought they had made fairly good progress. He, however, did not by any means take all the credit for this; he had only done the bidding of the Council. He had had the privilege of working under some very able Presidents, and looked upon his association with them with pride. He was deeply conscious of the honour they had conferred upon him.

KINDRED ASSOCIATIONS.

Mr. HOLTON proposed the toast of "Kindred Associations." The future of the gas industry, he said, concerned the juniors more than anyone else, for the simple fact that the future belonged to them. The industry was splendidly led by the Institution, and also by the Senior Associations in various parts of the country. An American humorist once remarked that, "We ought to be careful how we choose our ancestors." But if they, as juniors, could be placed in the position of choosing men who ought to have led the gas industry, they could not have selected better men than those who had led it. [Applause.] They, as juniors, undoubtedly owed a great deal to the work of the Senior Associations. It was, for instance, a very pleasing feature to note that the Midland Junior Association was started by the Midland Senior Association. He was hopefully looking forward to the day when the affairs of the Senior and Junior Associations would be more closely interlinked. It was advisable to bear all these points in mind, because the success of one meant the success of all. He asked them to drink heartily to the health of the President of the Institution, of the Presidents of the various Senior Associations, and of their fellow Juniors.

In proposing the health of the President of their Association, Mr. J. M'NICHOLL (Warrington) remarked that he had looked forward to the proceedings that day with great expectations, and these expectations had been more than realized. Mr. Heald, in his address, had set up a high standard of excellence.

Mr. HEALD, who was also accorded musical honours, returned thanks.

FILTRATION PLANT FOR NEW YORK WATER.

The plant for the filtration of the Croton water supply for New York City has been designed for an average normal daily supply of 320 million gallons, but equal to working up to 400 millions. It includes a covered mixing chamber with a capacity of 7 million gallons, affording a 30-minute period of detention. This chamber will vary in depth from 20 to 22 feet, and will contain a series of channels so arranged that the velocity of flow may be kept at 1 foot per second. The water in its passage through the chamber will make numerous sharp turns. The five settling-basins will be covered by a groined arched roof, and will have a total capacity of 76 million gallons, affording a detention period of six hours. The average velocity of the water through these basins will be 21 inches per minute. The basins are 25 feet deep, are equipped with baffles, and cover a ground area of 10 acres.

The 80 mechanical filter units will be arranged in eight rows on opposite sides of four galleries to the south of the settling-basins. They will have an aggregate net filtering surface of 2·7 acres, and the filtering material will consist of 2 ft. 6 in. of sand and 1 foot of gravel. There will be four rotary blowers to supply air for agitating the filtering material during cleansing. The filter effluent will pass into a covered concrete filtered water reservoir with a capacity of 365 million gallons; and there will be installed apparatus for applying a solution of hypochlorite of lime.

The head-house has been arranged to handle alum, quicklime, soda, and hypochlorite. It is expected that the average amount of alum used will be 1 grain per gallon, with a maximum quantity of 2 grains. The quicklime maximum has been set at 2 grains per gallon, and soda (as an alternative) at 1·5 grains per gallon. The amount of hypochlorite of lime necessary has been estimated at from 5 to 10 lbs. per million gallons of water. The plant will be located in the east basin of the Jerome Park reservoir.

The Del Monte Process.

The prospectus of the Company formed to acquire the "patent" rights in the Del Monte process was issued last week, and met with a "very mixed" reception by the London papers—ordinary and financial. The "Pall Mall Gazette" called attention to certain omissions from the document; and their adverse comments were emphasized by a letter from Mr. F. D. Marshall, M.Inst.C.E. Apart from the fact that the number and date of the patent acquired were not stated by the promoters of the Company, Mr. Marshall pointed out that, with the patent specification before him, he could not trace anything original, or which would tend to produce the results obtained as stated in the prospectus. He continued: "The patent simply refers to a method of preheating an 'inert gas,' preferably coal gas, in a coil, and passing the same into a vertical circular-sectioned retort, in which the coal is being carbonized. It is difficult for a technical man to understand how such a process can produce any beneficial results, apart from an ordinary system of low-temperature carbonization, such as practised by 'coalite' and others, and which has hitherto proved unsuccessful." Mr. Marshall asks why Mr. Butterfield's account and trial of the process were not published, as set forth in the "JOURNAL" for March 18, adding: "Mr. Butterfield is a gas engineer of high repute, and it seems curious that his report (a not altogether satisfactory one) was ignored in the prospectus in favour of Mr. Blount's, who is not to my knowledge a gas engineer, and the process, all said, is purely a gas engineering problem, and can only be judged by gas engineers of experience." Finally Mr. Marshall says: "£50 of stock in a concern of £150,000 capital does not appear to be an overwhelming responsibility for a director to assume; and beyond this the public may appreciate the fact that there are practically no technical men of repute on the Board."

"A.B.C. Guide to Patents."—We have received from Messrs. Butterworth and Co., of Bell Yard, Temple Bar, E.C., a book bearing this title, written by Mr. Robert E. Phillips, M.I.Mech.E., Assoc.M.Inst.C.E., in collaboration with Mr. A. Millward Flack, who is a Fellow of the Chartered Institute of Patent Agents. The authors acknowledge, in their preface, that the number of guides and text-books dealing with patents for inventions is legion; and the special utility claimed for their work is that the grouping of the matter in paragraphs arranged under alphabetical headings facilitates reference, and allows of desired information on any particular point being obtained with the minimum of trouble. The price of the book is 2s. 6d. net, bound in cloth.

Destroying Algæ in Water.—Referring to the recent trouble caused in North London by the growth of algæ in the water, "Nature" last Thursday pointed out that in America it is quite common for waters to have an unpleasant, fishy, oily, or "geranium" taste, due to these growths. Some species of algæ grow best during the colder months of the year; while others attain their maximum development during the summer. Our contemporary says the best way of killing algæ is to treat the affected water with copper sulphate (dose from 1 lb. to 10 lbs. per million gallons); and Dr. Houston, the Director of Water Examination of the Metropolitan Water Board, has found that the most satisfactory way of removing the taste from a water which has become already tainted is to use potassium permanganate, in doses of about 2·5 to 5 lbs. per million gallons.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

The Annual Meeting of the Association was held on Saturday afternoon in the Heriot-Watt College, Edinburgh—Mr. A. Bishop (Newtongrange), the President, in the chair.

THE GAS-ENGINE.

The minutes of the last annual meeting having been adopted, a paper by Mr. R. B. Chalmers (Alva), as given below, was read and discussed.

EVERY-DAY EXPERIENCES IN GAS DISTRIBUTION.

Mr. John Ferguson (Forfar) recapitulated the salient points of his paper on "Every-Day Experiences in Gas Distribution" (see "Journal" for Feb. 11, p. 397), which should have been considered at Dundee, but was taken as read.

In the course of a very brief discussion, one or two points as to the need for free cookers and free gas-fires were emphasized; and in this connection, the work of the British Commercial Gas Association was referred to as being of a beneficial kind.

Mr. Geddes (Granton) thought that a satisfied consumer was the best asset from a business point of view.

Mr. Ferguson said that the question of escapes with them was left to the consumer and the landlord to settle.

REPORT BY THE COUNCIL.

The Hon. Secretary (Mr. Lawrence Farquhar) read the annual report of the Council for the session 1912-13, which stated that the membership at the end of the session was 96, of whom 83 were ordinary and 13 honorary members. The number on the roll showed a decrease of two, as compared with the preceding session. Following the practice of previous years, four meetings were held at which papers were read and discussed. Five visits were also made to various works; and these proved, as they always had done, full of interest and instruction. The joint visit with the Western District of the Association was resumed this year, and was very successful. Speaking generally, it was remarked that the reversion to the winter period had had a marked improvement on the attendance; but on one occasion—the visit to the Bedlay coke-ovens—the exceptional weather conditions prevented even a representative number of members being present. They desired to record their appreciation of the kindness and hospitality extended to the Association by the various companies and corporations whose works were visited, and to acknowledge the assistance they had received from those honorary members who were present at the gatherings. Regret was expressed that the Association had lost through death the support of a valued member, Mr. George Porteous, of Calton Hill, Edinburgh. During the session, the following members were appointed to wider spheres of influence: Mr. James Dickson, to Johnstone; Mr. Lawrence Farquhar, to Alloa; Mr. Thos. Harper, to Forfar; Mr. W. Mann, to Auchterarder; Mr. James Mitchell, to Montrose; Mr. G. P. Mitchell, to Dundee; Mr. W. M. Williamson, to Forres.

The annual balance-sheet showed that the income had amounted to £21 19s. 4d., and that there was a balance in the hands of the Treasurer of £8 2s. 7d. Included in the payments was the cost of the President's Medal, £3 7s. 6d.

OFFICE-BEARERS.

The following office-bearers were elected:—

President.—Mr. Wm. Geddes, Granton.
Vice-President.—Mr. R. B. Chalmers, Alva.
Members of Council.—Mr. Percy Bloxham, Calton Hill, Edinburgh; Mr. R. Simpson, Dunfermline; and Mr. Gourlay, East Wemyss.
Secretary.—Mr. Lawrence Farquhar, Gas-Works, Alloa.

At the call of Mr. Chalmers, a cordial vote of thanks was accorded to Mr. Farquhar for his services as Secretary.

Mr. Bishop returned thanks for the manner in which the members had supported him in the chair during the session.

Mr. Geddes moved, Mr. Chalmers seconded, and it was unanimously agreed, that the subscription should in future be 6s. per annum, this sum to include a copy of the "Transactions."

A vote of thanks having been accorded to Mr. Bishop for presiding, the proceedings were brought to a close.

GAS-ENGINES.

By R. B. Chalmers.

[A Paper read, and Illustrated by Blackboard Drawings, before the Scottish Junior Gas Association, Eastern District, April 5.]

In commencing this short address on gas-engines, I would point out that it is not intended to be a scientific treatise on the subject, but simply a talk about gas-engine affairs as the manager of a small gas-works comes in contact with them. As a rule when a gas-engine is installed in premises in a small town where there are no engine repair shops, the gas supply is blamed if the engine refuses to work at any time; and the gas manager, being informed of the trouble, immediately sets about showing that the gas supply is correct, or, if wrong, puts it right.

I will endeavour to point out some of the troubles and infirmities that may overcome gas-engines. One of the first practical gas-engines in use was the Bisschop. In this, the gas and the air were drawn in during the first quarter of the out-going stroke of the piston, which uncovered a small hole, a flame was drawn in, and the mixture exploding the piston completed the stroke; the incoming stroke expelling the exhaust gases. In this engine, the gases are at atmospheric pressure before exploding. This is a two-stroke or two-cycle engine, and gets an explosion once every two strokes.

THE OTTO-CYCLE ENGINE.

The four-stroke or four-cycle engine, commonly known as the Otto-cycle engine, is at present by far the largest class of internal combustion engine in use, so far as numbers are concerned. In this cycle the first outgoing stroke of the piston draws in a mixture of gas and air, the ingoing stroke compresses the mixture into the combustion chamber, the mixture is exploded at the end of the compression stroke, and the expanding gases drive the piston outwards, and the return stroke expels the exhaust gases. Thus we have the cycle: First, suction; second, compression; third, explosion; fourth, exhaust.

GAS SUPPLY.

The gas supply is not connected direct to the engine, but is regulated through a gas-bag. This bag is usually a round cast-iron box, and is fitted with an inlet valve worked by a flexible diaphragm, which forms one wall of the bag. When the gas fills the bag, the diaphragm is extended, and closing the inlet valve, shuts off the gas supply—in other words, disconnects the engine from the meter. The gas in the bag is then at atmospheric pressure, and during the suction stroke of the engine is sucked into the cylinder along with air, and the diaphragm falling in, the gas-valve is opened and the bag once more fills with gas. Sometimes the valve sticks, and then the gas supply to the engine is at the town's pressure, and the engine gets too much gas, with the result that the efficient working is upset, and each suction stroke of the engine is shown by the pulsation of the adjoining lights.

STARTING.

Between the gas-bag and gas supply valve on the engine there is usually a stopcock opening to the atmosphere. When preparing to start the engine, this cock is opened and the diaphragm of the gas-bag is held in for a minute or so, and the gas fills the bag and blows the air out of the bag and pipe. This ensures a supply of gas immediately the engine is turned. Before turning the fly-wheel, the half-compression device should be put in operation. This opens the exhaust valve a short time during the compression stroke, and allows some of the mixture to escape—thus enabling the fly-wheel to be more easily turned round.

IGNITION.

The compression pressure in ordinary gas-engines may be anything up to 80 lbs. per square inch; and this release may reduce it to 30 or 40 lbs. At the end of the compression stroke, the mixture is exploded. This may be by means of a flame, a red-hot tube, or an electric spark. In the old slide-valve engine a small jet of gas was kept burning, and in the slide valve a small compartment being filled with gas ignited by the jet was moved along till it came in line with a port to the cylinder, and the compressed charge was ignited. This type of engine was very liable to go wrong. The gas jet, &c., had to be very delicately adjusted. This variety has now given way to the higher compression tube-ignited engine.

In tube ignition, a metal or porcelain tube is screwed into a hole or port in communication with the combustion chamber. The tube is kept at a bright red heat by means of a bunsen flame burning in an asbestos lined chimney which surrounds the tube and is adjustable for height. The mixture is compressed into this tube, and, coming in contact with the red-hot wall, is ignited. If the tube be not hot enough, the mixture is not ignited; if hot too near the cylinder, the mixture will be ignited too soon, and bring about a back-fire, causing the engine to reverse, to the danger of the attendant. When a metal tube is used, there is sometimes trouble with the tube becoming choked. The carbon in the gas combines with the red-hot iron, and gradually the tube fills up; and as the mixture cannot be compressed into it, the engine refuses to work. Where a porcelain tube is used, no such trouble occurs; but the tube is liable to be cracked through bad fitting, &c. On the whole, however, the porcelain tube is more satisfactory than the metal one.

In tube-ignited engines the mixture is exploded at the end of the compression stroke, and the point or time of ignition is variable in only a slight degree. In electrically ignited engines, the point of ignition may be altered late in the power stroke for easy starting and slow running, and early in the compression stroke for fast running. At the moment of ignition or explosion, the pressure may be anything up to 300 lbs. per square inch. The piston must be a good fit in the cylinder, to prevent the escape of gases at this pressure. But when the piston is a good and safe working fit it is not tight enough to prevent the escape of the gases; so that piston rings have to do the work of providing a gas-tight sliding joint. These rings are usually of cast iron, split at one side, and when compressed till the ends meet are a true circle the exact diameter of the cylinder. They fit into grooves in the piston, and are free to expand against the walls of the cylinder.

The grooves into which the rings fit must be kept clean and free from burnt oil. In some gas-engines, the rings are pinned to the piston, and although free to move vertically in the grooves they cannot move round.

On the exhaust stroke of the piston the exhaust valve opens, and the exhaust gases are driven out. When this valve opens, a flame may be discharged through it; so it will be seen that it must be made of good material to prevent warping and wasting. This valve frequently gives trouble through becoming pitted on its face and seat. If pitted, it must be ground in position (with emery powder and oil) until a good, clear, bearing surface shows all round the face of the valve and the seat.

Hints on Overcoming Defects.

In the case of a small modern gas-engine refusing to work, the first thing is to ascertain if there is a good supply of gas. This is seen by opening the air-cock on the gas-pipe and holding in the diaphragm of the gas-bag. Let us suppose this is all right. Then we turn the fly-wheel to see if there is good compression, and we find the compression very poor. Take out the exhaust valve and see if it is seating all right, and give it a grind till we get a good bearing surface. Fix it in, and see that it is clear of the exhaust operating rod by about an eighth of an inch. Try the compression again; and if we find it still poor, disconnect the big end of the connecting rod and draw out the piston. Examine the rings. We find they are stiff and fixed in the grooves. Ease them with paraffin oil, and take them out of their grooves. This is easily done by using four strips of thin steel or tin about half an inch broad. These are pushed down, one at a time, between the end of the ring and the piston. Slide these strips round the piston until they are equidistant; and then the ring will easily slide off. Clean out the grooves and replace the rings. Replace the piston, having liberally oiled it. We now find the compression right. We try the engine and find it will not start. Take out the ignition tube and examine it. It may be corroded up or burst. It is corroded and swollen, so we fix in a new one. If we have no new one as supplied by the makers, one can be made out of a piece of steel tube of suitable diameter by welding-up one end.

We find the engine starts now, but does not give full power. We can safely expect the proportions of gas and air to be correct; so we disconnect the exhaust pipe at the valve, and find the engine now gives full power. We will likely find the exhaust pipe choked with either rust or oil caked hard with the heat. This is caused by too liberal lubrication of the cylinder, and the excess of oil gums or chokes-up the grooves for the rings, and some of it is driven as a vapour through the exhaust valve and deposited in the exhaust pipe. The exhaust pipe being choked, the exhaust gases cannot escape quickly enough, and a back-pressure is thrown on the cylinder. This means that the incoming charge of gas and air is diluted with exhaust gas; thus reducing the explosive power and therefore the power of the engine.

A Popular Two-Cycle Engine.

I have here a half-horse power two-stroke or two-cycle engine which I have lately made. It is not exactly finished, but will do to show how this type works. I may say that this type is becoming very popular where small portable engines are required. They are extensively used for driving pumps, agricultural implements, &c., and dynamos. This particular engine will easily drive a dynamo of 150 watts output—roughly 120-candle power.

The engines are easily started and practically fool-proof. There are only three moving parts in the engine, and no valves. The piston, connecting rod, and crank-shaft and fly-wheel are the only moving parts. The piston covers and uncovers ports in the cylinder wall for the gas inlet and exhaust outlet. When the fly-wheel is revolved so that the piston travels upwards, a charge of gas and air is drawn into the crank case. When the piston moves downwards, the charge is compressed in the crank case, and at the bottom end of the stroke a port is uncovered in the cylinder wall and the charge rushes up the transfer port and drives out the air that is in the cylinder. When the piston again travels upwards, it compresses the charge in the cylinder, at the same time drawing another charge into the crank case. At the top of this stroke the mixture is ignited by an electric spark, and the piston is driven down. At the bottom of the downward stroke the piston first uncovers the exhaust port and then the inlet port; at the same time compressing the charge in the crank case. When the inlet port is uncovered, the new charge immediately rushes up the transfer port and drives out the exhaust gases. Thus we have the cycle: First stroke, drawing the charge into the crank case, at the same time compressing the charge in the cylinder; second stroke, transfer of the charge from the crank case to the cylinder, immediately after explosion, and expulsion of the exhaust gases—giving one power stroke in every revolution. The top of the piston is fitted with a deflector to guide the charge to the top of the cylinder and the exhaust gases to the exhaust port.

This particular engine is built for a speed of from 500 to 1000 revolutions per minute, and is not provided with a throttle for slow running. Where a throttle is employed, it is usually fixed in the transfer port.

Mr. Chalmers exhibited a wooden section model of a gas-engine, and also the model of his ½ H.P. two-stroke gas-engine, alluded to in the paper. He explained, and illustrated by these, the different matters referred to in his contribution; and his remarks were clear, and to the point. He also cited several examples of how he managed to repair gas-engines, and sounded a note of warning relating to them. It was too often thought, he said, that something was wrong with the pressure, when the fault really lay with the engine, and how it had been treated. Usually, the gas was all right.

DISCUSSION.

Mr. Henry O'Connor said he should like to express his sense of the great usefulness of such a lecture as Mr. Chalmers had given them, and he would also like to compliment him upon the lucid and simple manner in which he explained the whole of the matters connected with a gas-engine. Mr. Chalmers had gone through the little points that were necessary to show the working of each part of it, and explained everything so clearly that even if they had no experience at all of gas-engines, they would have learned something about the parts of an apparatus which should be understood by everybody connected with a gas-works. But the unfortunate thing about a gas-engine was that it was not so suitable for gas-works as the steam-engine, for the one purpose for which they mostly needed it. This was in the exhauster-house; and a gas-engine was only economical at one speed—practically full speed. The varying speeds needed during the summer time and the winter made it not a satisfactory apparatus in a gas-works; and therefore, while they would much like to practise what they preached, when trying to get the public to use a gas-engine, they were bound to own that it was not very satisfactory for the one purpose for which they required it. Thus it was that a good many people connected with gas-works had not studied the gas-engine as closely as they would have done if it had been needed in their works. But this was no reason why everybody connected with a gas-works, whether of the outdoor or indoor staff, should not at least endeavour to understand the principles of the gas-engine; and they should also learn what parts of the apparatus were likely to go wrong, so as to be able to put them right in the way Mr. Chalmers had done on several occasions. He felt certain this knowledge would help the corporation or the company they were serving, and would make the consumer realize that gas suppliers had the interest of the consumers at heart. There was one little point he might refer to—regarding compression. A great many people did not understand why compression could be good; but when they learned that compression pressure governed the pressure at the time of the explosion, they would understand how important it was. If they had a compression pressure of about 50 lbs., they would have an explosion pressure of close upon 200 lbs.; and if they had a compression pressure of 80 lbs., there would be an explosion pressure of about 300 lbs. For a very little compression pressure, they had over 100 lbs. explosion pressure. This compression pressure was a very important matter, and Mr. Chalmers had explained how to make it good.

Mr. Chalmers thanked Mr. O'Connor for his appreciatory remarks. He recalled that he was a boy at school when he made his first gas-engine—which was of the Bisschop type.

A hearty vote of thanks was passed to Mr. Chalmers.

ELECTRIC CURRENTS AND UNDERGROUND GAS AND WATER PIPES.

One of the items on the programme for the last meeting of the New England Association of Gas Engineers was a lecture by Mr. Albert F. Ganz, Professor of Electrical Engineering in the Stevens Institute of Technology, Hoboken (N.J.), on "Electrolysis from Stray Electric Currents." The lecturer first gave a definition and explained the theory of electrolysis, then indicated the sources of stray electric currents, and described as follows their general effects on underground piping.

The current flowing through the rails from trolley cars back to the power station produces in these rails a drop in potential—that is to say, points in the rails away from the station have a positive potential with reference to the rails at the station. Since potentials are measured relatively, it is convenient to consider the negative terminal of the dynamo, which is assumed to be connected to the rails at the station, as at zero potential. The stray current causes the underground pipes to be negative to the rails at points away from the station, and positive to the rails near it. The negative potential of the pipe, *plus* the drop on the pipe, *plus* the positive potential of the pipe, equals the drop in the rails. Assuming a potential difference of 550 volts is maintained at the station, 10 volts are lost in the trolley wire, 520 volts are used by the motors of the cars, and 20 volts are left to bring the current back to the station. If the negative bus-bar and the rails at the station are considered as at zero potential, the rails at the car in the assumed case will have a potential of + 20 volts. Thus, for practical purposes, the ground, with its underground pipes, is subjected to a potential difference of 20 volts, and the amount of stray current produced is that due to them. If the rails are laid in the usual way—that is, in contact with ground—the 20 volts will send some shunting current through the ground and through the underground pipe. Under the assumed conditions, there is a drop of 8 volts from the rails to the pipe near the car, a drop of 4 volts in the pipe itself, and a drop of 8 volts from the pipe through the ground to the rails at the station. It is, therefore, seen that it is

the potential difference or drop in grounded rails caused by the return current which is the cause of stray currents through ground. Attempts should consequently be made to keep the potential difference or drop in rails as low as practicable, in order to keep stray currents through ground down to a minimum.

Where stray currents flow on underground pipes, they do no harm, except where they leave the pipes to go to the surrounding soil. At such points corrosion of the iron from electrolysis will take place, and theoretically there will be a loss of 20 lbs. of iron per annum for every ampere of electric current leaving the iron. Some have assumed that, with the low densities at which current generally leaves underground pipes, little or no corrosion is produced. A number of experiments made by myself have clearly shown, however, that, even when current leaves iron for street soil at an extremely low density, corrosion is produced which is at least equal to, and is frequently greater than, the theoretical amount. This increase of the actual over the theoretical amount is undoubtedly due to secondary chemical reactions set up by the action of electrolysis.

The underground structures which are most likely to be subjected to destruction from electrolysis caused by stray electric currents are piping and lead cable systems. Oxidation or corrosion of such pipes or cable sheaths will occur wherever current leaves the pipe or cable sheath for ground. In the simplest case, current flows from rails through ground to the pipes at points distant from the power station, runs along the pipes, and leaves them to return through ground to the rails in the neighbourhood of the station. Where the current flows from rails to ground, the rails will be corroded; and where it flows from pipes to ground, the pipes will be corroded. If the pipe-line is a uniform electrical conductor, the pipes will be corroded only in the neighbourhood of the station. If, however, it is not a uniform conductor—as, for instance, if there are one or more high-resistance joints in it—the current on the pipe will shunt around these joints to produce oxidation or corrosion on one side. This action gives rise to joint corrosion, which is frequently found. Where there are two or more underground piping systems, it also frequently happens that current shunts from one system to another through the intervening soil, producing electrolytic corrosion where the current leaves the pipe. Such shunting currents are often caused by accidental high-resistance joints in one of the pipe-lines; and such shunting may occur anywhere, and without reference to the location of the power station. Where a direct-current trolley railway system passes through a town which has an independent piping network, and where the power station supplying the trolley line is in some other locality, then if stray electric currents are produced from the trolley line where it passes through the town, they will flow on the piping system, making it positive to ground and to rails in the direction towards the station and negative in the direction away from it. In this case, electrolysis of the piping will be produced at the ends of the piping system towards the station.

Where current leaves a wrought-iron or steel pipe for ground, the oxide of iron resulting from electrolysis is diffused through the ground, and streaks of iron oxide can generally be found in the surrounding soil. Electrolysis of wrought-iron or steel pipes usually results in pits, which eventually go entirely through the wall of the pipe. It has frequently been found in practice in the case of gas-pipes that where a service-pipe lies in clay or other tightly packed soil, it may be pitted through in many places without giving any external sign of leakage, because the soil surrounding the pipe maintains it gas-tight. When cast-iron is corroded by electrolysis, the oxide of iron mixed with graphite usually remain in place, leaving the outside appearance of the pipe unchanged. The material resulting from electrolysis of cast iron usually has the consistency of hard graphite, and can be cut with an ordinary knife. There have been many cases in which a cast-iron main was carrying gas or water without any apparent leak, where a single blow with a hammer drove a hole right through the pipe. Here the electrolytic action had corroded the iron entirely through the pipe, and the oxide of iron had remained in place, and, together with the surrounding soil, had prevented the pipe from leaking. Whether or not the mixture of iron oxide and graphite resulting from electrolysis remains in place so as to keep a pipe gas or water tight, depends upon the surrounding soil conditions. It is therefore seen that an underground piping system may be suffering severely from electrolysis without having given any outward sign of the damage. A physical examination with a test hammer is required in the case of cast-iron piping to establish definitely whether or not it has been damaged by electrolysis.

For a given current leaving an iron pipe, there is practically no difference in the amount of iron destroyed between cast iron, wrought iron, and steel. The electrical resistivity of cast iron is, however, about ten times as great as that of wrought iron or steel; and the usual lead joints in cast-iron pipes also have a resistance many times greater than the screw-coupling joints usual with wrought-iron and steel pipes. For these reasons, a given voltage drop through ground will cause a much smaller current to flow on a cast-iron pipe than on a wrought-iron or steel one—thus practically making cast-iron pipes much less subject to electrolysis than wrought-iron or steel pipes. The most frequent damage from electrolysis is found in the case of service-pipes where these cross under trolley rails or other underground conductors to which they are positive.

A number of investigations have been made to determine the effect of electrolysis on iron or steel embedded in concrete; and these have shown that where the iron is an anode—that is, where current passes from the iron to the concrete—this effect is to corrode the iron and form rust which occupies more space than the iron, and causes expansion which finally cracks the concrete. Recent experiments have shown that an extremely small current, flowing from an iron rod to a surrounding block of concrete, will produce enough corrosion to crack the concrete in the course of one or two years. They had also shown that, where the iron is a cathode—that is, where current passes from concrete to the iron—a softening of the concrete is produced in the immediate neighbourhood of the iron which will eventually destroy the bond between them.

The introduction in recent years of buildings constructed entirely of reinforced concrete has raised the question of the possible damage to such buildings from electrolysis of the reinforcing steel. Where reinforced concrete structures are located near railway power stations which have a grounded negative bus-bar, there may be a considerable potential gradient through the ground upon which the building stands; and in such cases it is possible that currents may flow through such a building. These currents, although very small in magnitude, may cause a great deal of damage, because the successive elements of steel and concrete form a series circuit, and damage will result at every point where current flows from steel to concrete or from concrete to steel. The most likely means of entrance or exit of stray electric currents into or out of such buildings is by underground gas or water pipes, or by foundations of concrete or of steel. In the light of these recent investigations, it would, therefore, seem a wise precaution in such buildings to instal insulating joints in every pipe which connects to the building from ground.

RADIATIONS FROM VARIOUS SOURCES OF LIGHT.

Dr. W. Vöge, of the Hamburg Laboratory, has lately described the results of his researches on the calorific and luminous radiations from the chief sources of light. The results are given in the following table, which is taken from the February number of our Italian contemporary "Il Gaz."

The first column of the table gives the distance of the source of light measured horizontally from a white surface for the luminous intensity of 88 lux; the second, the quantity of light measured horizontally in Hefner candles; the third, the amount of energy consumed per hour in grammes, litres, or watts; the fourth, the consumption per hour for the corresponding illuminating power; the fifth contains the indications of the galvanometer—giving the deviation produced with the carbon filament lamp; columns 6 and 7 give the total quantity of radiating heat for each lamp, in calories per hour and per candle; and the last column gives the temperature of glass chimneys, bulbs, and globes.

All the lamps tested had an efficiency of 88 lux; the light falling upon a white surface. The distance from the photometer to the light was regulated so that the surface illuminated always received an intensity of light equal to 88 lux. A Rubens thermo-element was placed near the photometer, with the object of recording the quantity of light emitted by radiation from the source of light. A mirror galvanometer connected with the thermo-element indicated the relative intensity of radiation. Reflection of the luminous rays was also measured with white paper surfaces. The tests were made in a horizontal direction with lamps of ordinary type, with globes, chimneys, and reflectors. Their calorific variations were estimated only after the lamps had been lit for some time, and had attained their maximum degree of heat.

—	1	2.	3.	4.	5.	6.	7.	8.
Petroleum lamp, old type of burner	43	16·0	44 grms.	2·75 grms.	42·0	484·0	30·00	236
Argand burner	43	16·0	192 litres	12·00 litres.	61·0	980·0	61·00	300
Auer, old type	103	93·0	114 ,,	1·22 ,,	11·0	580·0	6·25	340
Lilliput burner, new type	96	81·0	79 ,,	0·98 ,,	6·6	403·0	5·00	238
Do. with white 6-inch globe	71	44·5	79 ,,	1·78 ,,	6·1	403·0	9·10	55
Graetzin lamp—								
With transparent chimney	106	99·0	97 ,,	0·98 ,,	9·8	495·0	5·00	..
With opal 4-inch globe	82	59·0	98 ,,	1·66 ,,	17·5	500·0	8·50	260
With Euphos ,,	88·5	69·0	98 ,,	1·42 ,,	14·5	500·0	7·25	260
Carbon filament 32-candle lamp, 108 volts	62·5	34·4	89 watts	2·58 watts	10·0	76·5	2·20	115
Osram 50-candle lamp, 110 volts	72	45·7	51 ,,	1·12 ,,	5·3	43·8	0·96	85
Nernst 60-candle lamp, with 3½ inch globe	85	63·5	116 ,,	1·83 ,,	7·6	100 0	1·57	93
Arc lamp, with 6½-inch globe	133	155·0	330 ,,	2·13 ,,	3·2	283·0	1·83	82

COMPOSITION OF ILLUMINATING GAS.

In recent issues of the "Comptes Rendus" of the French Academy of Sciences, MM. Lebeau and Damiens described a method for determining the composition of a gaseous mixture composed of hydrogen and saturated hydrocarbons. As this method can be made of general application, they considered it would be interesting to apply it to the examination of more complex mixtures. Accordingly, in the number of the above-named publication for the 10th ult. they gave the results obtained with coal gas. The first sample examined was the gas supplied in Paris; and it was taken at the École Supérieure de Pharmacie. By slowly running, by the aid of a mercury pump, a known volume of the gas into air-cooled condensers, it was separated into two portions—the first composed of non-condensable gases, hydrogen, methane, carbon monoxide, nitrogen, and oxygen; the second consisting of saturated hydrocarbons, homologues of methane, ethylene and acetylene carbides, carbonic acid, vapours of heavy hydrocarbons, and steam.

The authors analyzed the gaseous products obtained by the first separation as follows: The mixture was treated first with potassium pyrogallate to absorb the oxygen, and then with acid cupreous chloride to estimate the carbon monoxide. After elimination of the hydrochloric acid vapours, eudiometric combustion of the mixture of nitrogen, hydrogen, and methane was effected; pure oxygen being utilized. The excess of oxygen was then absorbed by potassium pyrogallate, which allowed of the direct estimation of the nitrogen. The small quantity of carbon monoxide produced in the last operation was taken into account. To collect the condensable portion, extraction was made by means of a mercury pump; care being taken to keep the condensers at − 23° C., to avoid entrainment of the steam and heavy hydrocarbons. The gaseous volume being known, the carbonic acid was analyzed by absorbing it with potassium. The acetylene carbides were then estimated with the authors' alkaline iodomercuric reagent, referred to in a previous number of the "Comptes Rendus," and the residue was subjected to the action of sulphuric acid at 63° Beaumé, which removed the propylene and its superior homologues. The sulphovanadic reagent was then employed to determine the proportion of ethylene. Afterwards there remained nothing but a mixture of saturated gaseous carbides, which were fractionated so as to convert it into portions of which the composition could be estimated from the eudiometric analysis.

In addition to Paris gas, the authors analyzed in the same manner two other samples—one obtained at Arcueil from large works, and the other, taken at Montlhéry, manufactured in local works. The percentage results are given in the following table:

	Paris Gas.	Arcueil Gas.	Montlhéry Gas.
Oxygen	0·04	0·85*	traces
Carbon monoxide	5·66	5·08	5·74
Hydrogen	54·08	50·15	55·98
Nitrogen	3·47	8·09*	3·36
Carbon dioxide, &c.	1·81	3·48	1·65
Methane	28·59	28·01	29·11
Ethane	0·75	0·77	
Propane	0·12	0·118	0·42
Butane	0·014	0·017	
Acetylene carbides	0·096	0·095	0·08
Propylene and homologues	0·48	0·40	0·18
Ethylene	2·12	1·69	1·81
Steam, benzol, &c. (by difference)	2·77	1·25	1·67
	100·00	100·00	100·00

* The authors thought the presence of these constituents might be due to the air accidentally introduced. Analysis again made on a product taken after an interval of a few days had the same composition. They thought, therefore, they could take it that at the place where the gas was drawn off, the proportion of oxygen was fairly constant.

These analyses, which the authors consider to be certainly the most complete hitherto made, prove that the presence of the superior homologues of methane is strictly established. The relative proportions of these different carbides were determined. It is the same for the ethylene carbides. As regards the acetylene carbides, the authors were able, working with a sufficient volume of gas, to regenerate them from their mercuric combination, and note that they mainly contained acetylene, with small quantities of heavier acetylene carbides. They call attention to the fact that the proportion of carbon monoxide is less than that generally supposed to exist in illuminating gas; and they say this is due to the fact that analysis of this compound is made in a mixture containing only gases which are strictly without action on the cupreous reagent.

It appears, from a paragraph in our American contemporary "Gas Logic," that the first mention of the occurrence of coal in the United States is made in the journal of Father Hennepin, a French Jesuit missionary, who in 1679 recorded the site of a "cole mine" on Illinois River, near the present City of Ottawa. The first actual mining of coal was in the Richmond basin (Va.), about seventy years after Father Hennepin's discovery in Illinois; but the first records of production from the Virginia mines were for the year 1822, when, according to one authority, 54,000 tons were mined. Ohio probably ranks second in priority of production, as coal was discovered there in 1755; but the records of production date back only to 1838.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Competent Engineering and Design.

SIR,—The remarks on this subject of Mr. A. G. Drury in his report on the Ilkeston gasholder disaster, and your own comments, suggest a few points bearing on the question from my own experience and observation in connection with the gas industry.

Unfortunately, there are few gas engineers of scientific training who have had the combined advantage of pupilage in the *higher* branches of engineering, such as marine or ship building (which stretches the brain, if I may so express it), followed by several years' experience in the best gas-plant makers' works and offices, as well as civil engineer's offices and gas-works. The early "brain-stretching" training makes gasholders and similar plant mere child's play; and therefore the gas community should seek to entice young men from the ranks of the higher branches of the profession of civil and mechanical engineering. But nothing can compensate for the lack of several years' training in gas-plant makers' works, offices, &c.

A gas-works alone is *not* a good school for *engineers*, for reasons I cannot now enter into. Nor is a gas contractor's alone, as I do not think any firm of gas contractors have anyone about them thoroughly trained in the higher branches of mechanics. They work by "rule-of-thumb" to a large extent, and copying designs of work already executed, and on the principle of development by trial. They seldom fully understand the mechanical *principles* upon which engineering structures should be designed. They are very fond of quoting that "a pound of practice is worth a ton of theory." But that is only because they are ignorant of what they term "theory;" and it is an easy, and, strange to say, generally speaking, an effective, excuse for their deficiencies.

This may appear a somewhat sweeping expression of opinion; but it is dictated by my own experience.

CIVIL ENGINEER.

April 3, 1913.

Mr. Liberty's "Centenary of Gas Lighting" Lecture.

SIR,—I find on reading over the paper on the above subject that I gave last month at the house of the Royal Society of Arts, that in chronicling the fact that the Leeds University conferred the degree of "D.Sc." on Sir Corbet Woodall and Mr. Charles Carpenter, I omitted to state that at the same Convocation the degree was conferred by the University on Mr. Thomas Newbigging, M.Inst.C.E., of Manchester. I feel I owe this apology to Mr. Newbigging, and trust you will find space for it in the "JOURNAL."

W. J. LIBERTY.

Herne Hill, S.E., April 7, 1913.

The "Hygienically Perfect" Gas-Fire.

SIR,—No doubt many of your readers would note with interest, as we have done, some very pertinent remarks on the subject of gas-fires which were made by Mr. H. O. Carr, of the Wandsworth and Mitcham Gas Company, in his presidential address to the Southern District Association. Perhaps we may be permitted to quote, for purposes of comment, an extract from Mr. Carr's speech:—

> "A well-known firm of gas-stove makers have recently evolved a gas-fire not requiring an extended flue pipe, which, by means of practical tests, has been shown to be capable of preventing any products of combustion being emitted into a room. This is quite true in many instances; and our thanks are due to the firm in question for the advancement they have made in improving the modern gas-fire."

We believe we are touching upon a matter of common knowledge when we state that we have met with success in designing a series of gas-fires capable of passing the whole of their products through the flue outlet without the artificial aids of chimney draught or attached flue pipe. In other words, the result of our efforts has been to achieve that very desirable consummation, a gas-fire which is hygienically perfect.

When we attacked the problem which we had set ourselves to solve, we regarded certain factors as absolutely essential to the end in view:

(1) A scientifically proportioned canopy, entirely devoid of pockets.
(2) A flue outlet correct in shape and size.
(3) The precise position of the flue outlet in its relation to the bottom edge of the canopy.

We maintain that a gas-fire embodying these *desiderata* is in itself hygienically perfect. More than this, it is capable of giving thoroughly satisfactory results when used in conjunction with a chimney which would be considered faulty if the fire fitted to it were lacking the constructional advantages we have enumerated.

We have never suggested that a gas-fire constructed on the lines laid down will, in all cases, overcome bye-passing when fitted to faulty chimneys, unless special precautions are taken. Remarks in the latter part of Mr. Carr's address would appear to suggest the impression that all fires not capable of complying with the conditions outlined above would serve no useful purpose. We would like to correct this impression, by emphasizing a proviso to which we have invariably called attention when discussing this question. In the case of a fire not capable of passing all its products through the flue outlet, when tested by our "Shadowgraph" standard, the fault may be readily overcome by fitting an adequate length of flue pipe when the fire is fixed.

We are aware that there are many fires which will work satisfactorily when provided with an elbow and a 2-feet length of flue pipe. But many have been, and are still being, fixed which require a considerably augmented allowance of piping.

An analysis of the conditions under which gas-fires are fixed reveals instances where no flue pipe at all has been attached to fires not complying with our standard; and others, again, in which the flue pipe has been unduly restricted. The last-named condition is often excused by

the extreme difficulty attendant upon running flue pipes of adequate diameter into the chimneys fitted with the certain types of modern coal-grates. The difficulty is a very real one, and clearly indicates the urgent need for gas-fires which will pass away the whole of their products unaided by any flue pipe whatever.

Another fact brought to light by our investigations is that many gas-fires are fixed by gas-fitters who have not the same incentive as gas companies to insure that the fire will give the best results of which it is capable. The point which we wish to urge upon your readers (and it is of supreme importance) is that no gas-fire should be fitted unless its hygienic efficiency is beyond question.

To insure this, it is absolutely necessary to ascertain, before the work is carried out, the exact length of flue pipe required. The Davis "Shadowgraph" method of testing gas-fires for hygienic efficiency has already been adopted by many gas undertakings as their standard. It is as simple as it is reliable, and enables the purchasers of gas-fires to correct with ease any deviation from the only standard which will satisfy the progressive men who figure in the gas industry of to-day—the highest possible.

In conclusion, we desire to place at the disposal of any one interested in the subject the results of our own investigations and experience. Such assistance as we can render is at the service of buyers and sellers alike, for we keenly realize that every gas-fire badly fitted is a serious set-back to gas as a heating medium.

THE DAVIS GAS-STOVE COMPANY, LIMITED,
CYRIL G. DAVIS, Managing-Director.

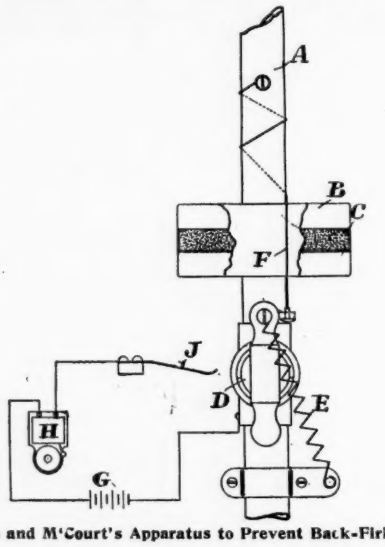
59, Queen Victoria Street, E.C., April 4, 1913.

REGISTER OF PATENTS.

Preventing Back-Lighting in Combustible Gaseous Mixtures.

BONE, W. A., and M'COURT, C. D., of Streatham Common, Surrey.
No. 6738; March 19, 1912.

This invention has reference more particularly (but not exclusively) to the process known as surface combustion, wherein use is made of the accelerating influence which an incandescent surface exercises on gaseous combustion, and in which an explosive mixture, consisting of combustible gas and air substantially in the proportions theoretically required for full and complete combustion, is supplied at a speed greater than the speed of back-ignition of the mixture to a bed of refractory material in fragmentary or granular condition in which the combustion takes place—as described in patent No. 29,430 of 1909 (Bone, Wilson, and M'Court).



Bone and M'Court's Apparatus to Prevent Back-Firing.

In accordance with this invention, the pipe through which the gaseous explosive mixture is supplied to the bed of refractory material, and at a point as near as may be practicable to the bed, is provided with a diaphragm of porous, permeable refractory material, constructed as set forth in patent No. 25,808 of 1909. Further, the pipe on the supply side of the air-tight casing is provided with a valve, which has a tendency to assume its closed attitude, and is normally held open by a fusible wire connected with the air-tight casing or the supply pipe—the arrangement being such that, when the casing or the supply pipe becomes heated, owing to the combustion taking place in it, the fusible wire is melted and no longer opposes the tendency of the valve to assume its closed position, which accordingly cuts off the supply of gaseous mixture.

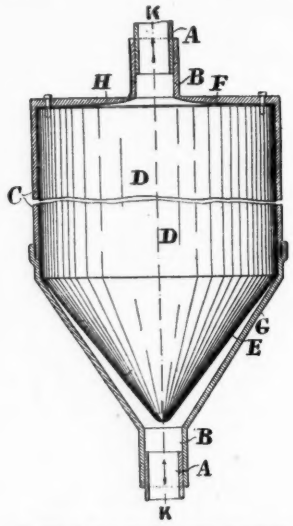
The illustration shows, "somewhat diagrammatically and by way of example only," an arrangement of apparatus in accordance with this invention. A is the pipe through which the gaseous explosive mixture is supplied to the bed of refractory material. B is an air-tight casing interposed between, and serving to connect two lengths of the pipe. It also forms a part of the thoroughfare for the gaseous mixture on its way to the bed of refractory material. C is the diaphragm of porous, permeable refractory material, constructed according to patent No. 25,808 of 1909. It is so mounted within the casing that the only passage afforded for the flow of gaseous mixture between the two lengths of pipe, separated yet connected by the casing B, is through the pores of the diaphragm. D is a valve inserted in the pipe A on the supply side of the casing B. It is under the action of a spring E, which tends to rotate it towards its closed attitude; while the action is opposed by a fusible wire F (of a lead-tin-antimony alloy). The wire is connected at one end with the lever of the valve D, and passes over, and in contact with, the casing to the main pipe on the delivery side of the casing, where its other end is secured by a screw. G is an electric battery connected, on the one hand, with the casing of the valve and, on the other, through a bell H, with a contact I so positioned that, when the valve is moving towards its closed attitude, its handle comes against the contact, the electric circuit is completed, and the bell rung.

The arrangement acts as follows in preventing or hindering the propagation of combustion of the gaseous explosive mixture backwards beyond a certain point in the supply pipe. Should the speed at which the mixture is supplied to the bed of refractory material be accidentally diminished and (or) allowed to fall below the speed at or below which back-ignition of the gaseous mixture is possible, combustion will be propagated backwards from the refractory material along the supply pipe towards the casing B and diaphragm C. When the combustion reaches the diaphragm, its further backward progress will be checked by the diaphragm; and the combustion of the gaseous mixture passing through it will take place substantially within the outer or exit surface layer of the diaphragm. Owing to the heat generated within the casing, the wire F will be fused, the valve D will be released, and will be closed by the action of the spring C thereon, and the supply of gaseous mixture cut off; an alarm at the same time being given by the closing of the electric circuit energizing the bell H.

Preventing the Backward Propagation of Flames along Conduits Carrying Combustible Mixtures.

IONIDES, A. C., of Porchester Terrace, W.
No. 12,346; May 24, 1912.

This device for preventing the backward propagation of flame works by causing the flame to be spread into a thin layer. In the patentee's earlier experiments with a device of this type, the spreading of the flame was effected in an annular passage parallel to, and of the same cross sectional area as, the main conduit—the flame reaching the passage through a radially extending passage at right angles to the direction of propagation. It was found, however, that by thus practically limiting the spreading of the flame to the annular passage, the latter had to be of such dimensions that the device offered considerable resistance to the flow of mixture under normal conditions. Therefore the present invention is intended to provide a device in which this disadvantage is avoided.



Ionides' Gas Combustion Conduit.

As shown in fig. 1, there is provided in the main conduit A, conveying (say) a mixture of coal gas and air in the proportions necessary for complete combustion, a conduit B, of slightly greater sectional area than A. Between the ends of B there is a casing C, forming a chamber of considerably greater sectional area than the main conduit or enlarged part B. Within it there is fixed a member D, having a conical surface E at the end facing the direction of normal flow of the gaseous mixture (indicated by the arrows), but having a flat surface F at the other end. The casing surface G, adjacent to E, is also conical, and of such dimensions that between E and G there is an annular passage which, as it diverges, and consequently increases in perimeter, is correspondingly decreased in width, so that the cross sectional area of the passage remains practically constant, and is equal to that of the enlarged part B.

In flowing through such a passage, the gaseous mixture is gradually spread into a layer of decreasing thickness, until the annular passage between the cylindrical surface of D and the casing C is reached, and which passage is also of the same sectional area as B. In this way, the minimum resistance is offered to the mixture in flowing from a conduit part of smaller perimeter to one of larger perimeter.

In order, however, to prevent the backward propagation of a flame along the conduit—that is, opposite in direction to the arrows—the casing wall H, adjacent to the flat end F, is curved in such a manner that the flame, in passing backwards along the conduit, besides being

subjected to a sudden change in its direction of travel, is spread radially into a thin layer, the sectional area of which always remains constant and equal to that of the conduit B.

For this purpose, when the end surface is flat, the adjacent surface H of the casing C must be hyperbolical. The curve of the surface H will, therefore, be such that the product of the distance of any point on the surface H, measured from the axis K of the conduit, into the distance from such point to the flat surface F, is constant, and equal to half the square of the radius of the enlarged conduit part B.

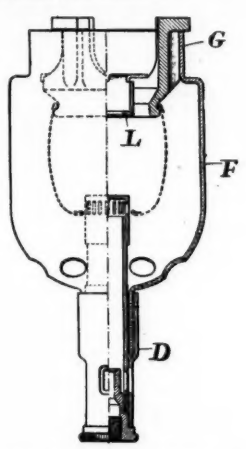
Obviously, the same result may be obtained by making the end surface F of the member D hyperbolical, while the surface H of the surrounding casing is flat.

Incandescent Gas-Burners.

LANGHANS, R., of Berlin.

No. 28,091; Dec. 5, 1912. Convention date, Dec. 13, 1911.

The invention relates to an incandescent gas-burner with an inverted mantle and burner-tube entering the mantle centrally from below. This form of burner, the patentee says, has suffered from various defects. In the first place, the central rod absorbs a large amount of the light radiating from the inner wall of the mantle; the exact adjustment of the mantle relatively to the slotted burner-head is attended with difficulties; and, finally, it is difficult, when fitting the mantle, to avoid injuring the edge of its lower opening, "so that the number of mantles used is excessive." These defects are said to be obviated by the present invention, in accordance with which the glass chimney of the burner is formed as a mantle support, so that the space inside the mantle above the burner-head is free, and there is no impairment of the light. Furthermore, the replacement of the chimney and of the mantle is a simple matter, and there is no risk of damaging the mantle; and finally the exact adjustment of the mantle relatively to the burner-head can speedily be effected.



Langhans' Upright Hanging Incandescent Light.

In the arrangement shown, a sleeve D is fixed adjustably in a vertical direction to the burner-tube—the sleeve serving for the reception of a neck to snugly surround the glass chimney F. This chimney comprises an annular offset portion G at its upper end, which serves for the reception of the arms of the ring, to which the inverted mantle is secured in the usual manner. In order to direct the flame outwards against the wall of the mantle at its upper part, a deflecting element L, in the form of a cylindrical or annular cap or disc, is suspended at the centre—in the mantle ring in the present case. In the bottom of the glass chimney air holes are provided for the admission of the secondary air.

The space inside the mantle is entirely free, "so that the luminous effect is not impaired by the passage of a body through the mantle, as is the case with the known upright hanging incandescent gas-lights." Furthermore, the lower edge of the mantle can be exactly adjusted relatively to the slotted burner head, even when it is alight, merely by rotating the chimney; and, finally, the guide-ribs afford "an exactly concentric and vertical guidance when inserting the mantle, so that injury to the edge of its lower opening is not liable to occur."

High-Pressure Gas-Meters.

KENT, W. G., and HODGSON, J. L., of High Holborn, W.C.

No. 7765; March 30, 1912.

This invention provides "a simple means for correcting a gas-meter for variations of pressure, so that the reading of the meter may be reduced to a standard pressure."

Various ways of effecting this object, by the employment of pressure measuring devices, have before been suggested, the patentees point out—for example, in patent No. 12,688 of 1910. But, according to their invention, the object is attained by transmitting motion from the spindle rotated by the meter to the first spindle of the counting train, by mechanism similar to that described in patent No. 20,360 of 1908. This consists of a pawl, which is caused, by the rotation of the meter spindle, to move around the spindle of the counter and which at each revolution of the spindle (or of a spindle driven from it) is caused to engage with, and drive, a wheel fast on the counter spindle, for a longer or shorter length of travel governed by the action of a pressure measuring device, in such manner that the motion actually transmitted to the counter spindle is increased or diminished in proportion as the volume measured off by the revolutions of the meter spindle is greater or less than the same volume reduced to standard pressure.

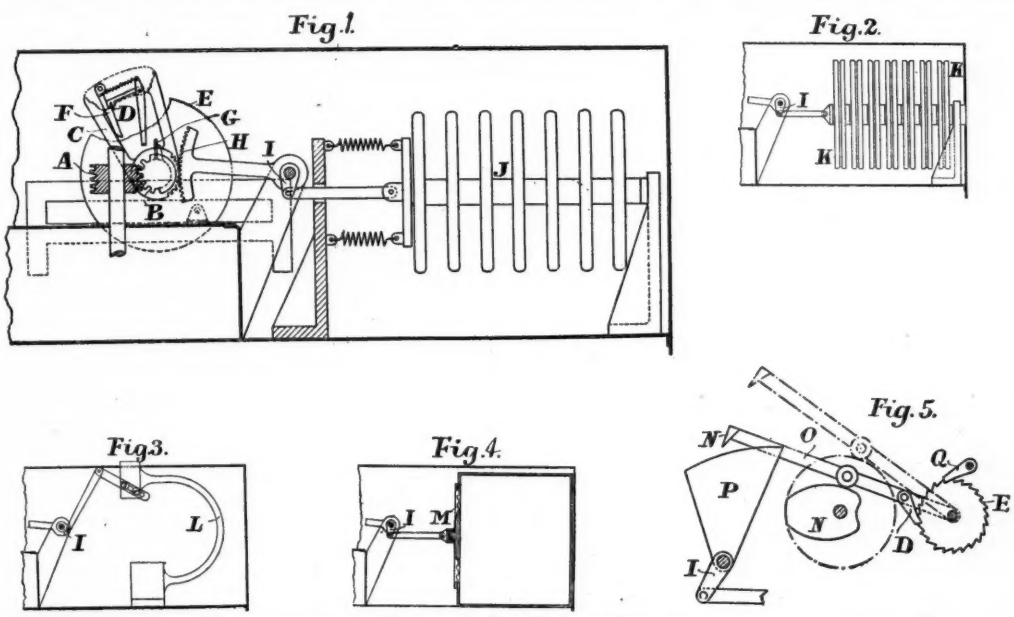
In fig. 1 A is a worm rotated by the meter and meshing with a wheel B fast with a frame C, pivoted to which is a pawl D adapted to mesh with the teeth of a ratchet wheel E in the counter train. The pawl is held out of engagement with the wheel E by an arm F pivoted to the frame; while a spring connecting the arms tends to put the pawl into engagement. At each rotation of the frame the arm F comes against a fixed stop, and the pawl is put into mesh and remains in mesh—thus driving the counter—until the arm meets a stop G, the position of which is controlled by the pressure of the gas. This stop is carried by a tooth wheel gearing with a toothed sector H rotated by a crank I actuated by a battery of aneroids J, "which contract with an increase of pressure of the gas surrounding them, and since their interior is exhausted take up a position corresponding to the absolute pressure."

Or the crank may be actuated by a battery of stiff diaphragms K, as in fig. 2, or by a Bourdon tube L, as in fig. 3—the interior of the diaphragms or tube being open to the atmosphere.

Again, the crank may be actuated as in fig. 4 by a diaphragm, or battery of diaphragms M, in the side of a closed box containing a volume of imprisoned air. The diaphragm expands with increase of temperature or a decrease of external pressure and "thus gives a movement approximately proportional to the change of the expression comprising the quotient of the absolute temperature by the absolute pressure." In this case, the movement of the crank gives a combined pressure and temperature correction.

The arrangements shown in figs. 1 and 4 are only suitable for small variations of pressure above and below that of the atmosphere; while those shown in figs. 2 and 3 are suitable for much higher pressures.

Fig. 5 shows an alternative mechanism to that of fig. 1. N is a cam rotated by the meter spindle, and O is a feeler pivoted on the spindle of the counter, on which spindle is a ratchet wheel E, which the feeler drives by means of a pawl D. The feeler is lifted once during each



Kent and Hodgson's High-Pressure Meters.

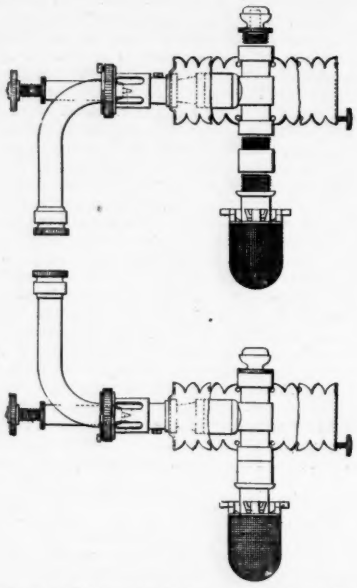
revolution of the cam, so that its point N^1 reaches the zero position shown in dots. The feeler then descends, driving the ratchet wheel anti-clockwise until the point N^1 reaches a cam P set by the crank I actuated as already described. Q is a pawl preventing backward movement of the ratchet wheel. The cam is so shaped that the distance between its surface and the zero position is proportional to the amount to be added to the counter, whether the counter registers in weight or volume units. Similarly the links transmitting motion from the aneroids to the sector may be so made that the counter may register in units of either weight or volume.

Incandescent Gas-Burners.

WELSBACH LIGHT COMPANY, LIMITED, and RULER, W., of South Wimbledon, S.W.

No. 15,745; July 5, 1912.

This invention provides means for adapting incandescent gas-burners for use with any ordinary gas-fitting, irrespective of the position of the gas aperture of the fitting (whether directed up or down), by providing the end of the tube in which the burner-nozzle is attached with two openings, in such a manner that one of them opens upwards and the other downwards.



Ruler's (Welsbach Light Company) Convertible Incandescent Burner.

As shown, the burner-tube is bent at right angles so as to form two limbs, one of which is vertical and downward, and the other horizontal when the burner is in position. The vertical limb is adapted to be attached to the nipple of any usual gas-fitting; while the horizontal limb is provided at its end with two branches—one projecting upwards and the other downwards. Each branch is provided with an internal screw thread so as to receive either a plug or the screwed portion of a burner-nozzle to carry an inverted mantle.

When it is desired to attach the burner to a fitting having a downwardly directed opening, the burner as a whole is inserted so that it assumes the position shown in the lower part of the illustration. The vertical limb is secured to the nipple of the fitting as before, while the branch which now projects upwardly is closed by the plug—and the burner-nozzle is screwed into the downwardly projecting branch.

The horizontal limb is provided with openings for the air supply, controlled by the usual apertured sleeve surrounding the tube at this part; and in front of these openings the tube leading to the branches is coned—the passage being contracted for a certain distance and then enlarged. Behind the air supply openings a valve is provided for regulating the supply of gas. This valve may be a needle valve, having a screw-threaded spindle and knurled head, by means of which "a sensitive adjustment of the gas supply is obtained."

For convenience of manufacture, and to allow the globe-holder to be readily attached to the burner-tube, the part of the tube which comprises the branches and the coned portion may be made separate from the rest of the tube, and be provided with a screw-threaded portion, which passes through an opening in the globe-holder from the inside and screws into the other portion of the tube.

Manufacture of Sulphate of Ammonia.

JOHNSON, J. Y.; a communication from the Badische Anilin und Soda Fabrik, of Ludwigshafen-on-Rhine, Germany.

No. 12,845; May 31, 1912. No. 14,114; June 17, 1912.

According to this invention, sulphate of ammonia is manufactured directly from sulphites of ammonia, "so as to render sulphuric acid plant unnecessary for such manufacture."

A simple method of carrying out the invention consists in first decomposing a small quantity of ammonium bisulphite solution—thus producing some sulphur, and then gradually adding further quantities of ammonium bisulphite solution, to the reaction mixture, which contains the necessary catalytic agent in the form of sulphur. In this way, the process can be carried out continuously.

The manufacture can also be carried out without the addition of a catalyst by subjecting a solution of ammonium bisulphite to "suitable local heating." This can be effected, for instance, by pumping a concentrated solution of ammonium bisulphite through tubes maintained at a temperature of about 180° C. or higher, and under a pressure of (say) from ten to fifteen atmospheres. The conversion of the ammonium bisulphite into ammonium sulphate takes place during the passage through the tubes—sulphur separating out at the same time; so that at the end the reaction is complete, and ammonium sulphate in solution is obtained. It is preferred to utilize the heat of reaction by causing the heat contained in the solution leaving the apparatus to be transferred to the solution which is entering the apparatus. "The process of the present invention can be carried out with comparatively small and safe apparatus, and this is of great advantage, because it is often difficult to obtain large apparatus suitable for work with acid solutions under pressure."

During the treatment of the ammonium bisulphite some sulphuric acid is formed; and it is often advantageous, the patentee remarks, to carry out the reaction in the presence of ammonium sulphite, provided that the quantity taken is not too great. The proportion of ammonium sulphite which can be advantageously mixed with the ammonium bisulphite should not exceed, but should preferably be somewhat less than, that represented by the following equation—

$$6(NH_4)\,HSO_3 + 3(NH_4)_2\,SO_3 = 6(NH_4)_2\,SO_4 + 3S + 3H_2O.$$

In carrying out the above reaction, if concentrated solutions of bisulphite be employed, a part of the ammonium sulphate crystallizes out—especially if the free sulphuric acid formed in the absence of sufficient ammonium sulphite be neutralized with ammonia; and the other part of the ammonium sulphate contained in the mother liquor can be obtained by evaporation. The sulphur can be separated in any convenient manner—for instance, in the liquid form from solid ammonium sulphate, or in the solid form by filtration from the ammonium sulphate solution.

It has been found, however, that the expensive operation of evaporating can be avoided if the ammonium sulphate liquor (either directly, or after removing that part of the ammonium sulphate which is crystallized out) be treated with ammonia and with sulphurous acid, or with ammonium bisulphite, which may contain some ammonium sulphite; so that the mother liquor is almost, or completely, saturated with bisulphite. In this case a large separation of the ammonium sulphate from the liquor is caused to take place, and it can be removed therefrom. This process has the further advantage that, after removing the ammonium sulphate, a concentrated solution of ammonium bisulphite is obtained (in some cases containing some ammonium sulphite), and this solution can be immediately employed for further conversion into ammonium sulphate, as already described.

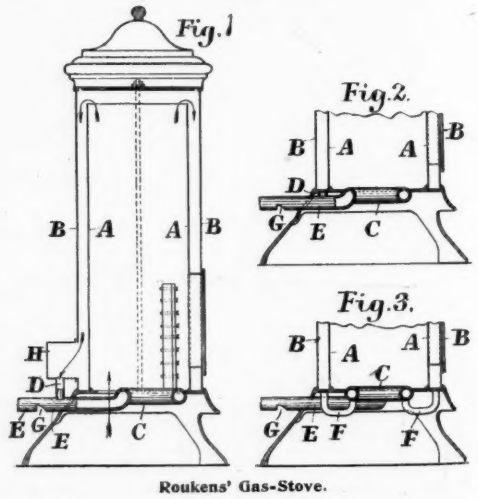
The following is given as an example of how the invention can be carried into practical effect: Add a quantity of powdered sulphur to a concentrated solution of ammonium bisulphite and heat and stir the mixture in an autoclave, at about 80° C. The reaction takes place with the development of heat, and is finished in a few hours; the reaction being accelerated in accordance with the amount of sulphur which is present. If desired, the rise of temperature can be regulated by means of external or internal cooling, or both. When selenium (either alone, or in combination with sulphur, or other catalytic agent) is employed, extremely small quantities are sufficient to promote the required reaction; and in this case also the reaction can be carried out at lower temperatures—for instance, at about 60° C., or below.

Gas-Stoves.

ROUKENS, J., of New Compton Street, W.C.

No. 22,307; Oct. 1, 1912.

According to this invention, the stove burner is arranged in a centra envelope open at both ends and surrounded by an outer envelope closed at both ends, in such a manner that the combustion gases which emanate from the burner in the central envelope pass afterwards between the two envelopes, and thence through one or more openings arranged near the bottom of the space between the two envelopes, and either directly, or by the intermediary of pipes, pass either into, or near, the burner, in order to be burned again.



Roukens' Gas-Stove.

The stove (as shown) consists essentially of a central envelope A open at both ends and placed in an envelope B, which is closed at both ends. In fig. 1, the combustion gases pass through the chamber H,

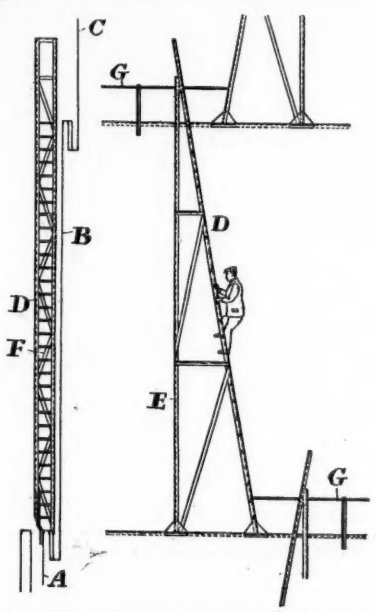
pipe D, and mixing chamber E, and then return to the burner C. In fig. 2, the combustion gases pass from the space between the envelopes A and B into the mixing chamber E, by the pipe D. In fig. 3, the combustion gases pass by the pipes F from the space between the envelopes A and B into the body of the burner C. These pipes F (any number) could also deliver freely into the flame of burner C, in order to burn the combustion gases.

Ladders for Spiral-Guided Gasholders.

BROADHEAD, J. W., and ROBERT DEMPSTER AND SONS, LIMITED, of Elland.

No. 16,655; July 17, 1912.

According to this invention, the ladder for each lift is supported upon the next lower lift; the ladder for the lowest lift being on the tank. Thus the ladders, which can be provided with hand rails, can be so arranged as to form a continuous path, zig-zag, spiral, vertical, or inclined, to the height of the holder when fully expanded. The ladders may be arranged either radially or circumferentially with relation to the holder, and the base of each ladder be connected to the top of the lute of the tank or outer lift by riveted gusset plates. It is preferred to make the ladder slightly inclined rather than vertical, "as in this form a man ascending or descending has more room for bending his knees, and can comfortably reach any convenient rung to steady himself with his hands, while his centre of gravity is supported by the rung or rungs under his feet."



Broadhead's (R. Dempster and Sons) Ladder for Spiral-Guided Holders.

The illustrations show an example of the use of the invention; A, B, and C indicating successive lifts of the holder, D the ladder, which with its standard or superstructure E is fastened to the top of the lute of the lift A, and is braced with bars F. Handrails G on the lute facilitate passing from one ladder to the next.

APPLICATIONS FOR LETTERS PATENT.

7036.—EVERED AND CO., LTD., and BOXALL, J. E., "Inverted burners." March 25.
7048.—FAULKNER, V. C., "Gas-fired furnaces." March 25.
7088.—STIMSON, E. F., "Gas-ranges." March 25.
7132.—BEVAN, J. W., "Recovery of sulphate of ammonia in producer plant." March 25.
7173.—HOLT, C. E., and BURGOYNE, J. S., "Purification of gas." March 26.
7202.—MITCHELL, J., "Acetylene generator." March 26.
7204.—SIMPSON, H. P., "Gas-burners." March 26.
7251.—MORLEY, E. W., "Anti-vibration device." March 26.
7268.—WILSON, W. A., "Simultaneously opening gas and water cocks." March 27.
7272.—TAKEDA, K., "Dressing ores by gas." March 27.
7273.—TOOLEY, H., "Gas-driven pumps." March 27.
7277.—BOOTH, J., and WEBSTER, F. A. & F. A., JUN., "Gas-valves." March 27.
7283.—ROBINSON, J. A., "Fixing diaphragms in dry gas-meters." March 27.
7317.—APPARATE-VERTRIEBS G.M.B.H., "Regulating the flow of gases." March 27.
7332.—MEADE, T., "Measuring and recording the discharge of liquids." March 28.
7424.—STILL, W. M., AND SONS, LTD., and ABBOTT, F. E., "Air-gas apparatus." March 28.
7444.—MUSK, H., "Incandescent burners." March 29.
7456.—RUSSELL, R., "Determining the flow of liquids." March 29.

At the half-yearly meeting of the Holyhead Water Company, a dividend of £2 6s. 7d. per cent. on the original capital and 2 per cent. on the additional capital was declared; leaving a balance of £117 to the credit of the current six months.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read a second time: Bishop's Waltham Water Bill, Mid-Kent and East Kent District Water Bill.

Bills reported, with amendments: Coventry Corporation Bill, Crowborough District Gas and Electricity Bill, Harrow and Stanmore Gas Bill, and Titchfield District Gas Bill.

The Pontypridd and Rhondda Joint Water Board Bill has been referred to a Select Committee, consisting of Sir Harry Samuel (Chairman), Sir John Barran, Mr. Arnold Ward, and Mr. Albert Smith; to commence sitting to-day.

CO-PARTNERSHIP BILL FOR COMPANIES.

In the House of Commons last Tuesday, Mr. James F. Hope, the Member for Sheffield, asked leave to bring in a Bill to promote the adoption of co-partnership by statutory and other companies. He said it was a Bill of a very uncontroversial character, and similar to one he brought in last year, which was accorded a first reading without opposition. That being so, he intended only very briefly to recapitulate its provisions. The Bill sought to promote the adoption of co-partnership by registered and statutory companies, and the procedure it suggested was different in the two cases. In the case of registered companies, it provided merely that they should be at liberty to adopt co-partnership without a change in the Articles of Association. He was informed that in many cases of registered companies it would require a long and cumbrous and difficult process in order to enable them to adopt co-partnership. In the case of these companies, the Bill provided that if they wished to adopt it, and if their Articles of Association stood in the way of doing so, they should normally adopt the model scheme sent out in the schedule to the Bill. At the same time, it was provided that they might alter the scheme if they could show to the satisfaction of the Board of Trade that it was not applicable to the special circumstances of their case. With regard to statutory companies, it was proposed that the model scheme should normally be incorporated in any Bill that a private company desired to obtain from Parliament; the onus being on the company to show that the scheme did not apply to their circumstances. If they failed to show this, then in the ordinary course the Parliamentary Committee would insert it as one of the provisions of the Bill. There would, of course, be no possible attempt to fetter the discretion of a Parliamentary Committee in regard to putting in other provisions more specially applicable to the company in question. Having given an outline of the model scheme, the hon. member turned to the general question. He said it was a rather remarkable fact that all the industrial troubles of the past year seemed for the moment to have faded away from the public mind. Last year the circumstances were more favourable for the introduction of a Bill of this kind, because the attention of the public and of the House was largely fixed on industrial disputes. This was not so at present; but he thought they would be living in a "Fools' Paradise," if they thought there had been any great change in the conditions of industrial life. It would only require some very slight unfortunate incident to revive all the trouble that was experienced last year. He could only put the Bill forward in a very tentative way. He believed that the true solution of industrial disputes was to be found in the principle contained in the Bill—that was to say, that there should be a visible bond of interest between capital and labour, and that the success of one should mean obviously and materially the advantage and progress of the other, and that they should be definitely linked in common interests. On these principles, and with this object, he had brought forward the Bill. He would make an appeal, first to the House to give the Bill a first reading as they did last year, and secondly to the Government and also to the two hon. members who controlled the fate of Private Bills (Sir F. Banbury and Mr. Handel Booth), and who were perhaps even more powerful than the Government in this respect, that the Bill should be allowed a second reading solely on one condition—that no attempt should be made to go farther with it in the ordinary course, but that it should be referred to a Select Committee, where its proposals and perhaps others of a somewhat similar kind might be properly threshed out.

Leave having been granted, Mr. Hope formally brought in the Bill, which was read a first time. As the hon. member showed, it is the same as the measure brought in by him last year, and given in the "JOURNAL" for June 25 (p. 993). It is preceded by the following

Memorandum on the Bill.

The Companies (Co-Partnership) Bill represents a tentative effort to encourage the principle of co-partnership in the industrial life of the country. The main objects of the Bill are, first, to enable companies to adopt co-partnership in cases where they would otherwise be debarred from doing so, either by their Private Acts of Parliament or by their Articles of Association; secondly, to set out in the form of a schedule a model scheme of co-partnership for their voluntary adoption; and, thirdly, to provide that such model scheme shall ordinarily be a condition for granting statutory power to new companies to raise capital, though, of course, without attempting to fetter the discretion of Parliamentary Committees in individual cases. Under the scheme certificates of partnership in the objects of the company and a share in its surplus profits are to be granted to all persons in its regular employment. It is provided that the standard rate of wages shall be taken to correspond with a standard return of 5 per cent. on all paid-up capital; and when the return is higher than 5 per cent., the employee becomes entitled to a bonus calculated at one-twentieth of his existing wages for every extra 1 per cent. paid in dividend. Thus a company with a paid-up capital of £100,000 and a normal wage bill of £20,000 would, if they paid 6 per cent, have to give the employees an extra £1000; if

they paid 10 per cent., £25,000; and 15 per cent., £30,000. Similarly, a workman with a standard wage of 30s. a week would get 31s. 6d. on a dividend of 6 per cent., 37s. 6d. on 10 per cent., and 45s. on 15 per cent. As, however, it is not desirable that the whole bonus should be paid over in cash, it is provided that Trustees shall be appointed, to whom at least half the bonus shall be paid, and by whom it shall be invested, if possible, in the shares of the company itself. In order to meet the varying circumstances of different industries, it is provided that in the case of registered companies the Board of Trade may allow other regulations to be substituted in individual instances, and in particular may allow a lower rate of bonus when salaries and wages bear a specially high proportion of the annual cost of the business of the company. There are also provisions for the election of Trustees and Directors and for the adjudication of differences.

TITCHFIELD DISTRICT GAS BILL.

HOUSE OF COMMONS COMMITTEE.—Wednesday, April 2.

(*Before Mr.* HUGH LAW, *Chairman, Mr.* MOUNT, *Mr.* PONSONBY, *and Sir* CUTHBERT QUILTER.)

This Bill, promoted by the Titchfield District Gas Company, provides for the re-incorporation of the existing non-statutory Company and an extension of the area of supply, together with the repeal of certain powers now held in the Company's existing and proposed area of supply by the Gosport Gas Company.

Mr. VESEY KNOX, K.C., and Mr. W. E. TYLDESLEY JONES appeared for the promoters; Mr. HONORATUS LLOYD, K.C., and Mr. ROSTRON represented the Gosport Gas Company.

Mr. VESEY KNOX, in opening for the promoters, said that the Bill was promoted by the existing limited Company with the object of dissolving the concern and incorporating a statutory Company to supply gas in the parishes of Titchfield, Sarisbury, Hook-with-Warsash, Botley, and Curdridge, near the Solent in the South of Hampshire. There was no opposition from any local authority; the only opponent being the Gosport Gas Company. The reason for this opposition was that three out of the five parishes included in the Bill were within the present statutory limits of supply of the Gosport Company. As a matter of fact, this had been the case for 48 years; but no supply had been given by the Gosport Company. Explaining the circumstances of the two Companies, Counsel said that, whereas the Titchfield Company was incorporated as a limited Company in March, 1865, to supply gas in Titchfield, the Gosport Company in June of that year obtained an Act for a large area in the same district, which included Titchfield, Sarisbury, and Hook-with-Warsash. But nobody seemed to have paid much attention to these districts—in fact, the Gosport Company did not seem to have cared about the Titchfield Company, nor the Titchfield Company about the Gosport Company. The nearest main of the latter was some four miles away; but this was only a 3-inch pipe, and obviously not suited for extension into Titchfield. The Titchfield Company passed through the vicissitudes which many small companies did, and eventually got into the hands of the mortgagees. Then the undertaking was purchased by a local gentleman, who, having no knowledge of the management of a gas supply undertaking, sold it for £1200 to Mr. King Hiller and Mr. W. A. Schultz, who, at the time of the purchase, estimated that it would be necessary to raise an additional £1400 to put the undertaking into a sound condition, which sum, however, eventually reached £4800. The undertaking was purchased in 1911; and all through the negotiations, and until last year, nobody seemed aware of the existence of the Gosport Company's powers in Titchfield. Then the Titchfield Company, having been put upon its feet by the new owners, desired to extend into the neighbouring parishes, and asked for the consent of the Fareham Rural District Council, who are the road authority—the intention being to remain a non-statutory Company. There was opposition, however; and the Company were informed that they had better go to Parliament for statutory powers. It was then, for the first time, that the Gosport Company made any move in the direction of giving a supply in Titchfield and the neighbouring parishes; for after the Titchfield Company had canvassed the parishes of Sarisbury and Hook-with-Warsash, the Gosport Company did likewise, and indicated their intention of opposing the Titchfield Company's Bill. The Gosport Company offered to supply at 3s. 10d. per 1000 cubic feet for ordinary consumers, and on the basis of 17 cubic feet per penny or 4s. 11d. to slot-meter customers; the Titchfield Company's prices being 4s. 6d. and 4s. 11d. respectively. When the present owners of the Titchfield Company took over the works, the price was 6s. 6d. It was at once reduced to 5s. 9d., and had since been brought down to 4s. 6d.—the present standard price in the Bill. As a result, the output had been doubled—viz., from 1,000,000 cubic feet in 1911 to 2,000,000 cubic feet in 1912. Before dealing specifically with the proposal in the Bill to repeal the powers of the Gosport Company in Titchfield and the surrounding districts, Counsel mentioned two points concerning the finance of the Bill. The Company formed by Mr. King Hiller and Mr. Schultz allotted these two gentlemen 400 shares as profit on their bargain; but now that the Company were applying for parliamentary powers, he (Counsel) had advised his clients that it was not the practice of Parliament to allow a profit of this sort to be capitalized against the consumer. Therefore, under a clause in the Bill, these shares were surrendered. The Bill did, however, provide for the allotment of 450 shares to these two gentlemen as underwriting commission for raising the further capital necessary to develop the undertaking; and this, he thought, was a moderate sum, having regard to all the circumstances of the case. Such underwriting commissions were recognized in the Companies Acts. Furthermore, if the Company had been a statutory concern, and the shares had been issued under the auction clauses, they could have been issued at a discount, which would have been the same thing. No dividend had yet been earned on the capital; and it was likely to be a few years before this happened. So that the return to those finding the capital could not be regarded as excessive. Coming to the position of the Gosport Company in Titchfield and district, Counsel emphasized the point that no serious efforts had been, or were being made, to give a supply there; whereas the Titchfield Company had actually deposited mains in certain streets in Sarisbury, but could not lay them owing to the refusal of the road authority to allow the streets to be broken up. Under these circumstances, he claimed he was justified in asking that the Gosport Company's powers in this area should be repealed. In support of this contention, he quoted a number of parliamentary precedents in which statutory companies had certain unexercised rights to supply in districts already being served by non-statutory companies; these powers being repealed by Parliament on the ground that the statutory company had allowed the other company to give a supply, and that it would be unfair to interfere with the business of the non-statutory company so developed. The Crawley, Leigh and Golborne, Draycott, Long Eaton, and Yorktown cases were referred to in this connection. These were all instances in which a statutory company's powers were repealed on the ground that the non-statutory company had given a supply, whereas the other company had not; and they applied to the present case absolutely so far as Titchfield itself was concerned. As regards the other districts, he could not put his case quite so high, because the Titchfield Company were not giving a supply. Nevertheless, he claimed that he was in the most advantageous position to do so. Further, no undertaking had been given by the Gosport Company that they would make a serious effort to supply; on the contrary, his information was that the Company had no intention of dealing with the districts in question at all.

Mr. *T. J. Wilkins*, Clerk to the Hook-with-Warsash Parish Council, spoke as to the general feeling of the residents there being in favour of the Titchfield Company, for the reason that the Gosport Company had done nothing towards giving a supply of gas for over forty years. There was not very much confidence that it would be given within a reasonable time even at 3s. 10d.; and the inhabitants were very strongly in favour of the Titchfield Company having the powers, in view of their efforts in the neighbouring district of Titchfield.

In cross-examination by Mr. HONORATUS LLOYD, the witness admitted that only within the last fifteen months had the inhabitants of his district considered seriously the question of a supply of gas, and nobody from Hook had ever asked for a supply from the Gosport Company. In fact, they were not aware, in Hook, until comparatively recently, that the Gosport Company had powers there. The Titchfield Company had first made the matter prominent; and he emphasized the point that the residents would rather have the gas at 4s. 6d. per 1000 cubic feet, as promised by the Titchfield Company, than at 3s. 10d., as promised by the Gosport Company, because the latter, it was felt, were the least likely to give it quickly, having regard to their past history. Witness admitted that he was in a difficulty on the point when Counsel promised to give an absolute undertaking to the Committee to provide supply. Then, he considered, the variation in price might make a difference to the public feeling. At the same time he quite thought that the Titchfield Company would be likely to employ more local labour than the Gosport Company; and this might tell in favour of that Company.

Mr. *R. Wallis*, a resident in Sarisbury, spoke in similar terms, as regards the views on the gas question, of the people of Sarisbury. Many houses there had been actually fitted with pipes and stoves in anticipation of the supply by the Titchfield Company. As a matter of fact the Company had deposited pipes in certain thoroughfares preparatory to opening the roads for their reception; but the refusal of the Rural District Council to allow the roads to be opened necessitated these pipes being removed.

In answer to the CHAIRMAN, witness expressed the opinion that, even assuming the price to the ordinary consumer was a little more at the hands of the Titchfield Company, the Sarisbury people would prefer it on sentimental grounds.

Mr. VESEY KNOX, at this point, suggested to the Committee that if there could be a short adjournment, there was the possibility of an agreement being arrived at, as a *modus vivendi* had been suggested which might be a way out of the dispute between the two Companies.

The Committee thereupon adjourned for half-an-hour.

When the parties subsequently re-entered the Committee room,

Mr. VESEY KNOX informed the Committee that an agreement had been arrived at, subject to the approval of the Committee, on the following terms:

(1) The Bill to go forward as laid before the Committee, with a clause following out an arrangement that if within two months after the passing of the Act the Gosport Gas and Coke Company give notice in writing to the Titchfield Company requiring them to sell their undertaking, the Company shall sell, and the Gosport Company shall purchase, the undertaking of the Company on the terms of paying to the Company the sums of money actually expended by them upon the undertaking, and, in addition thereto, the sum of £450 and the amount of the costs, charges, and expenses of obtaining the Act.

(2) The Gosport Company shall take over all the liabilities and assets of the Company as from the date of purchase.

(3) Until the expiration of the said two months, the Company to carry on the undertaking in the ordinary course of business, and not to create or expend any sums on capital account, or incur any liability on capital account without the consent of the Gosport Company.

(4) If any difference arises, the matter to be referred to the arbitration of a chartered accountant or any proper person; the Arbitration Act of 1889 to apply.

Continuing, Mr. Knox drew the attention of the Committee to the fact that this clause only provided for the purchase by the Gosport Company; but inasmuch as it was not certain that that Company would give notice of purchase, it was necessary for him to satisfy the Committee as to the remaining portions of the Bill, and that his clients were in the position of carrying on the undertaking themselves.

The CHAIRMAN suggested that it might be necessary to have some undertaking from the Gosport Company that, in the event of purchase, they would at least maintain the supply to the persons who are at present supplied by the Titchfield Company.

Mr. HONORATUS LLOYD pointed out that all the obligations under the

Bill would devolve upon the Gosport Company in the event of purchase, and there was an obligation to give a supply within five years.

Mr. *W. A. Schultz* was then called and formally proved the preamble of the Bill. The captial powers would, he said, be sufficient for from five to ten years.

The preamble of the Bill was declared proved, and clauses were subsequently adjusted.

One or two other points in the Bill, not referred to in the proceedings, may perhaps be mentioned. In the first place, the capital of the Company is £15,000 of original capital, *plus* £10,000 additional capital, and one-third borrowing powers. The standard price is 4s. 6d, the "Metropolitan" No. 2 burner is the test burner, and 14-candle gas is prescribed.

Special attention may also be directed to two clauses. In the Model Bill this year there appears, for the first time, the following clause, which is embodied in the present Bill [the names of the places, of course, being added]:—

> "If, after the expiration of five years from the passing of this Act, the Company have not laid down mains for the supply of gas in the parishes of Sarisbury, Hook-with-Warsash, Botley, or Curdridge, the local authority of the district in which any such parish not supplied with gas by the Company is situate, or any company or person, may apply for an Act of Parliament or Provisional Order for the purpose of providing such a supply within any of the aforesaid parishes not supplied by the Company, and for the repeal of the powers of the Company in that behalf."

In view of last year's controversy on the question of residual products, clause 5 in the Bill is also interesting:

> "The Company shall be established for the purpose of manufacturing, storing, and supplying gas for lighting, heating, motive power, and other purposes within the limits of supply as defined by this Act, and may provide, produce, sell, dispose of, and deal in, gas, coke, tar, and all other residual products resulting from the manufacture of gas, and generally may carry on any business usually carried on by gas companies."

CROWBOROUGH DISTRICT GAS AND ELECTRICITY BILL.

HOUSE OF COMMONS COMMITTEE.—Thursday, April ?.

(*Before Mr.* HUGH LAW, *Chairman, Mr.* MOUNT, *Mr.* PONSONBY, *and Sir* CUTHBERT QUILTER.)

This Bill confers further powers upon the Crowborough District Gas Company, and empowers them to supply electricity within their existing limits of supply, in addition to raising fresh capital.

Mr. H. CLOUDESLEY appeared for the promoters; and Mr. G. M. FREEMAN represented the East Sussex County Council.

Mr. CLOUDESLEY explained that the Company were incorporated in 1899 to supply gas in Crowborough, Mayfield, Buxted, and Hartfield, in Sussex, and certain parishes in Kent within a radius of four miles of Holy Trinity Church, Tunbridge Wells. The authorized capital of the Company is £24,000 in £1 shares, bearing a maximum dividend of 10 per cent., and £6000 borrowing powers, bearing a maximum dividend of 5 per cent., all of which has been issued. Owing to unfortunate management from 1899 and to within a short period of the present time, there had been an overdraft of £2252 incurred; but the *personnel* of the Company had been entirely changed. Mr. Andrew Dougall, for many years Engineer and Manager of the Tunbridge Wells Gas Company, was now Chairman of the Company. It was proposed in the Bill to adopt the sliding-scale, with a standard price of 5s., and to raise £30,000 additional capital in 5 per cent. stock. The Bill also authorized the Company to supply electricity within the gas limits. There was no opposition on the preamble; but there was a petition by the East Sussex County Council in respect of clause 9, which gives power to lay pipes for ancillary purposes. The County Council also desired further protection as regards their main roads and bridges.

Mr. *Andrew Dougall*, the Chairman of the Company, in formally proving the preamble of the Bill, said that for the past three years, during which time the Company had been under his mangement, there had been a dividend of 2½ per cent.; but for the three years prior, no dividend had been earned. Under the Bill, by the adoption of the sliding-scale, the shareholders were sacrificing arrears of dividend to the amount of £28,197. The present price of gas was 4s. 4d. per 1000 cubic feet, with discounts varying from 2½ to 15 per cent. During the three years of the present management, the price had been reduced by 6d. per 1000 cubic feet.

Mr. FREEMAN, for the East Sussex County Council, informed the Committee that he had certain clauses to bring up in respect of the main roads and bridges; and some argument took place as to whether he was entitled to regard his opposition as on preamble or as a purely clause opposition.

Mr. E. MOON, K.C., the Speaker's Counsel, who happened to enter the Committee room at the moment this argument was taking place, advised the Committee that, by the drafting of the County Council's petition, they would be entitled to oppose on preamble.

The CHAIRMAN, in mentioning this, said it was a pity Mr. Freeman had not objected when Mr. Cloudesley had stated in his opening that there was no preamble opposition.

Mr. FREEMAN said he was only opposing the preamble so far as it related to what he regarded as an improper use of the county roads and bridges. For the moment, however, he would agree to postpone any question he had to put to the witness on the matter.

In answer to the CHAIRMAN, witness admitted that the 5s. standard was rather higher than in many cases; but he argued that the special circumstances of Crowborough justified the higher figure, as it would be impossible for them to otherwise induce the public to subscribe to the capital.

Cross-examined by Mr. FREEMAN, witness was told that the proposals of the Company would affect 15 county bridges and 40 miles of county roads. The position of the County Council was, said Counsel, that if at any time the county authority desired to rebuild any of the bridges, the cost of moving the Company's mains should be borne by the Company and by the ratepayers, and also that all mains should be laid at a depth of not less than 2 ft. 6 in. Similar powers had been inserted in no less than 28 Acts; and the Board of Trade made it a rule to insert such a provision in all Provisional Orders. So far as the depth of 2 ft. 6 in. was concerned, this was already in the Company's Act of 1899, and Mr. Dougall said he saw no objection to it going into the present Bill. He was not, however, disposed to accept the other proposal of the County Council as to the cost of removing mains, as with a small undertaking like Crowborough it was essential not to place any unnecessary burdens upon it. It was put to witness that in the Bognor Act of last year these terms were imposed.

Just prior to the luncheon interval, it was intimated to the Committee that perhaps an agreement might be come to with the County Council; and when the Committee reassembled, the County Council's proposals were accepted, after an unsuccessful attempt by the promoters of the Bill to obtain a few modifications.

Some discussion then took place with regard to a report upon the Bill by the Board of Trade. According to its provisions, the price to the gas consumer under the sliding-scale depended upon the dividends paid upon the whole of the Company's capital, whether used for gas or electricity; and the Board of Trade drew the attention of the Committee to the fact. It was suggested that in the likely event of the electricity undertaking proving unremunerative for the first few years, the gas consumers would be deprived of reductions in price which might take place were the dividends to depend upon the gas profits only, and that it would be more fair to keep the gas concern distinct from the electricity undertaking as regards capital, and allow the price to the gas consumer to depend solely upon the position of the gas undertaking.

Mr. CLOUDESLEY urged upon the Committee the fact that the gas consumers would, on the other hand, benefit from any success of the electricity undertaking, and that a provision such as that proposed by the Board of Trade would militate against raising capital. Further, there was no precedent for the suggestion of the Board of Trade.

The Committee were evidently in a dilemma with regard to the point; and the Chairman eventually sent for a representative of the Board of Trade.

Mr. *H. Booth*, of the Board of Trade, subsequently attended and gave evidence. He reiterated the view expressed in the report of the department that, as the Bill stood, the gas consumer might be prejudiced, in that he would not get reductions in price, if the electricity undertaking was not successful, so soon as he otherwise would do.

The Committee then had the room cleared. When the parties were readmitted,

The CHAIRMAN announced that the Committee found the preamble of the Bill proved; but they would require the promoters to carry out one of two things—either to adopt a standard price for gas of 4s. 6d., instead of 5s., or, in the alternative, to give effect to the suggestion of the Board of Trade, that the price of gas should vary according to the divisible profits of the gas undertaking only. The Committee felt that some further protection was needed for the gas consumers than was afforded by the Bill.

Mr. CLOUDESLEY asked whether the Committee would be prepared to make the price 4s. 9d.

The CHAIRMAN said the Committee were not inclined to do this.

Mr. CLOUDESLEY, after conferring with his clients, said the Company would adopt the 4s. 6d. standard.

The Bill was then reported to the House for third reading.

COVENTRY CORPORATION BILL.

HOUSE OF COMMONS COMMITTEE.—Tuesday, April 1.

(*Before Mr.* HUGH LAW, *Chairman, Mr.* MOUNT, *Mr.* PONSONBY, *and Sir* CUTHBERT QUILTER.)

Further consideration of this Bill, the opening proceedings in which were reported in the "JOURNAL" last week (p. 39), was heard to-day.

Mr. C. C. HUTCHINSON, K.C., and Mr. J. W. JEEVES appeared for the Corporation; Mr. J. G. TALBOT, K.C., represented the Warwickshire County Council.

Other portions of the Bill occupied the attention of the Committee during Monday. Towards the end of the day, Mr. Talbot opened his case against the Bill; and it was anticipated that when the Committee assembled this morning evidence on behalf of the Warwickshire County Council would have been called. But when the Committee met,

Mr. HUTCHINSON announced that all differences with the County Council had been met. The terms were the withdrawal of the Parish of Binley and a large portion of Stoneleigh and Walsgrave-on-Sowe—*i.e.*, the portion of the latter already supplied by consent of the County Council is retained; while in Willenhall the Corporation will only supply in the portion where mains are already laid, as explained in Mr. Stevenson's evidence.

Clauses for the protection of the County Council, as regards the laying of gas-mains in the remainder of the added area, were subsequently adjusted. These are the usual clauses; no special protection having been granted.

PROVISIONAL ORDERS (NO. 1) CONFIRMATION BILL.

UNOPPOSED BILLS COMMITTEE.—Thursday, April 3.

(*Before Mr.* DONALD MACLEAN, *Chairman, Mr.* E. MOON, K.C., the Speaker's Counsel, *and Mr.* STAVELEY-HILL).

This Confirmation Bill includes a number of Provisional Orders relating to gas matters, brief abstracts of which are given below.

CHORLEY URBAN DISTRICT COUNCIL.

Under the Chorley Order of 1907, the Council were empowered, with the sanction of the Local Government Board, to borrow, on the

security of the revenue of their gas undertaking and of the general improvement fund and general improvement rate of the borough, sums not exceeding £25,000 for gas purposes. The present Order varies this provision to the extent of increasing the borrowing powers to £125,000.

FILEY URBAN DISTRICT COUNCIL.

Under the Filey Water and Gas Act, 1898, the Council are prohibited from using, for the purpose of manufacturing gas or residual products, any lands except those described in the first schedule to that Act. The present Order extends this power to further lands specified in the present Order.

NEATH CORPORATION.

This Order is to increase the borrowing powers of the Corporation from £20,000 (as provided in the Provisional Order of 1893) to £100,000, and to extend the existing powers as regards the use of land for gas purposes to additional lands specified in the present Order.

NEWTON-IN-MAKERFIELD URBAN DISTRICT COUNCIL.

The object of this Order is to alter the Council's existing powers as to the application of gas profits to relief of rates, as follows: "The Council may apply, in aid of the general improvement rate, so much of any such moneys remaining in any year as may, in the opinion of the Council, not be required for carrying on their gas undertaking and for paying the current expenses connected therewith; but no part of any such moneys shall be applied in aid of the general improvement rate when the price of gas supplied to private consumers otherwise than through prepayment meters exceeds 3s. per 1000 cubic feet."

The CHAIRMAN pointed out that as this was the first time this session that Gas Orders had been up before the Committee, he would like to know whether the question of residuals had been brought into conformity with what had been decided.

Mr. A. E. WOOD, of the Local Government Board, pointed out that this question did not come in except as regards applying existing powers to new lands in one or two of the Orders.

Mr. MOON added that the powers in the present Orders merely transferred those already granted in previous Acts; and so far as residual products were concerned, no new powers were being granted. The Orders simply meant that where at present residuals could be manufactured and stored on lands already authorized, a similar power was given as regards the new lands.

The preamble of the Confirmation Bill was then declared proved.

LEGAL INTELLIGENCE.

A COMPENSATION CLAIM AT WANDSWORTH.

At the Wandsworth County Court, last Tuesday, the Wandsworth Gas Company were sued under the Workmen's Compensation Act by Philip C. Paulisky, of Bramford Road.

Mr. MARTIN O'CONNOR appeared for the applicant; the Company being represented by Mr. SHAKESPEARE.

It was explained that Paulisky was employed by the Company last year, and met with an accident on Dec. 14. He was working with another man, the latter being engaged in beating something with a heavy bar. On one occasion, the man missed what he was aiming at, and struck Paulisky a severe blow on the head. His head was cut, and he was dazed. Since the accident, he had suffered from headaches, derangement of vision, and fits. He was taken to Bolingbroke Hospital, and afterwards was attended to at St. George's Hospital. He received compensation until February, when it was stopped. Asked as to his present condition, Paulisky said he could hardly walk. On one occasion something gave way in his head, and he dropped a lamp. He was offered work in February, but did not accept it because he was queer.

Medical evidence in support of the claim was given.

For the defence, William Rose said he was wielding the iron bar. He missed his aim; but the iron, before hitting Paulisky, struck a lighting-up stick and a boy's shoulder—the force being thus broken. John Hancock, a foreman, said that, on instructions, he offered the applicant some work in February, cleaning bricks. Paulisky mumbled something, and left the works, and witness had not seen him since. The work he did before the accident was now performed mechanically. Dr. Mark Robinson said the man was really fit for work on Dec. 28. He did not tell witness anything about fits, nor about dropping a lamp. Dr. Wilson, of the Bolingbroke Hospital, said that the man was certainly fit on Jan. 16.

His Honour said the Medical Referee was satisfied the condition of the man's eyesight had no connection with the blow on the head. All he was suffering from was nervousness. He thought the best course to adopt would be to reduce the compensation to 1d. per week dating from February.

Lincoln Gas Profits and the Rates.—The minutes of the Gas Committee which were adopted at last week's meeting of the Lincoln City Council contained a recommendation that out of the year's profits £5500 be placed at the disposal of the Finance Committee, to be applied in the relief of the rates. In presenting the minutes, the Mayor (Alderman T. Wallis) remarked that on the year's working there was a balance available of £7304. Out of this, they had agreed to give £500 towards the construction of a pleasure ground, in addition to contributing the £5500 to rate relief. The Committee also recommended that the price for the supply of gas for power purposes be 3d. per 1000 cubic feet less than that for ordinary consumers.

MISCELLANEOUS NEWS.

MANCHESTER STREET LIGHTING.

Committee's Recommendations.

The Manchester Lighting Committee have approved a joint report prepared by the Gas Engineer (Mr. J. G. Newbigging) and the Electrical Engineer (Mr. S. L. Pearce), with reference to the lighting of several of the main streets of the city.

In the course of their report, the Engineers state that they have carefully considered the question of public lighting, and are agreed on certain recommendations. The first is that a further extension on a moderately large scale of the lighting of the principal thoroughfares in the city be made with high-pressure gas and electric arc or metal filament lamps. The streets proposed to be set apart for the two lighting systems respectively are indicated in the report; the total length of those to be lighted by high-pressure gas being 13,500 yards, and of those to be lighted by electricity 11,835 yards. In making the allocation, the Engineers have had regard to the thoroughfares in which special arc lighting cables are already laid and the suitability or unsuitability of the streets scheduled for centrally suspended lighting or side lighting—it being their opinion that, broadly speaking, one set of streets is best dealt with by means of electricity, while others are more suitable for the high-pressure gas system. They state that they have not attempted to deal with secondary thoroughfares, or with the lighting of courts and passages; and they recommend that this be deferred pending the result of the present proposal.

WEST BROMWICH GAS UNDERTAKING.

The Installation of Vertical Retorts.

At the Meeting of the West Bromwich Town Council last Wednesday, reference was made to the recommendation of the Gas Committee to instal two additional settings of vertical retorts, at a cost of £3740, noticed in the "JOURNAL" last week (p. 40).

Mr. C. Brockhouse, the Chairman of the Gas Committee, in submitting their report, said the Council might ask why they were bringing forward a second scheme when one for the installation of three settings of vertical retorts at a cost of £11,500 had already been sanctioned by the Local Government Board. He might explain that the reason the Committee did not proceed with the complete scheme for the installation of five settings at the onset was that they were most anxious to move very cautiously. Since the Contractors had commenced the work of putting in the three settings, their Engineer (Mr. Harold E. Copp) had found that the horizontal retorts would require immediate attention; whereas when the first scheme was launched he thought they would last for a year or two at least. The repair of these retorts would involve an outlay of £600; and the Committee thought it would be better to replace them by two extra vertical retort settings. In this they considered they were doing a good stroke of business. The question with the Committee was whether they should spend money on retorts which were obsolete, or have a complete system that would put them in a better position to meet the increasing demands upon the gas undertaking. They did not want their gas-works to be behind other concerns; and there was no doubt the vertical retort system was the thing for the future.

Mr. W. LAWLEY said, in asking the Council's sanction to the additional retorts, he believed the Committee were pursuing a very sound policy. When they introduced the scheme to instal three settings, it was suggested in the Committee that it would have been better if they had gone in for the five. By sanctioning the proposed scheme, they would produce gas on one system; whereas if they did not adopt the Committee's recommendation they would have two systems in use. He felt sure the Council would never regret the step they were asked to take.

The report was adopted.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

No Reply to the Adverse Criticism of "Nonulus."

The Half-Yearly Meeting of the Company was held on Monday of last week, at the offices, D'Olier Street, Dublin—Alderman W. F. COTTON, M.P., D.L., the Chairman, presiding.

The SECRETARY AND MANAGER (Mr. F. T. Cotton) submitted the report and accounts [*ante*, p. 52].

The CHAIRMAN, in moving their adoption, said he was sorry to have to inform them that the Directors had had a very anxious half year, owing to the abnormal prices they had had to pay for some of the coal carbonized, the difficulty of obtaining it, and the varying quality supplied. The gross receipts for the six months amounted to £163,552; the expenditure being £119,701. This left a balance of £43,851, from which had to be deducted interest upon loan capital, &c., £7763, and, in addition, £2000 placed to the credit of the suspense account. It would be seen that the profit was smaller than usual; and but for the exertions of the Directors in getting forward supplies of coal, it would have been much less. However, it was not the first time the Company had experienced similar difficulties, which had been overcome in time. There was a slight increase in the sales of gas during the six months to Dec. 31; and the number of consumers had also increased. The same also applied to cooking and heating appliances, gas-fires, geysers, and all other gas apparatus. They could only hope, as on former occasions, that the prices of coal would give way, and that it would improve in quality. If not, a burden would be imposed upon trade which would seriously retard business. At present, all gas undertakings

were striving to replete their stocks, while colliery owners were holding out for abnormal prices. The make of gas per ton of coal carbonized during the half year under review fell short of the previous half year; but it might be taken as satisfactory—having regard to the inferior quality of coal they were obliged to manufacture from. Besides, he reminded them they had two small stations—Kingstown and Bray—from which the yield of gas was never so satisfactory as when manufactured on a large scale. To return to the question of coal, they were obliged to pay £6193 in excess of the corresponding period. Wear and tear of meters reached £453, and incandescent fittings £1375. During the six months there had been 1823 new installations—each fitted with cooker, pendant, and brackets. There were 123 cookers supplied to houses which had not formerly been furnished with gas; and also 756 cookers and 767 heating stoves let on hire. Further, 159 heating stoves and 19 gas-fires were purchased and fitted at the expense of consumers. It was not generally known that they had three competitors supplying electric light—the Corporation of Dublin and the two principal townships, Rathmines and Pembroke. Under all the circumstances, the Board considered that the report was favourable. In the accounts they would find a new item—National Insurance account charges, amounting to £258. When he told them that the large London Companies had suffered, naturally they would not be surprised at a small company like the Alliance being in the position in which they found themselves. He mentioned that the Gaslight and Coke Company were over £40,000 short of dividend, and the South Metropolitan over £30,000, on the half-year's earnings.

Mr. MURRAY seconded the motion, which was agreed to.

On the proposition of the CHAIRMAN, seconded by Mr. LAWLER, a dividend at the rate of 5 per cent. was declared.

Mr. JOHN MURPHY proposed the re-election of the retiring Directors (Messrs. W. F. Cotton and R. S. Tresilian).

Mr. LAWLER seconded, and it was passed.

The CHAIRMAN thanked the meeting for the renewed expression of confidence. He had, as they knew, always taken a very deep interest in the affairs of the Company, and he would continue to do so for the remainder of his life, let the period be long or short.

After the re-election as Auditor of Mr. Michael Murray, a vote of thanks was passed to the Chairman, Directors, and officials.

The CHAIRMAN acknowledged the compliment on behalf of the Directors, and Mr. F. T. COTTON for the staff.

ILKESTON GAS MANAGEMENT.

[FROM OUR LOCAL CORRESPONDENT.]

Though, from the Corporation point of view, the recently published report of the Government Inspector who was deputed to make inquiry into the circumstances attending the gasholder disaster which occurred in January of last year could not be regarded as embodying much that was of a satisfactory character, it was not unreasonably to be expected that Mr. Drury's criticism of the action of the responsible Committee would elicit something pertinent by way of reply. But at the last meeting of the Council, there was significant silence in regard to the main points involved, and particularly as to the "hoodwinking" process, which was condemned recently by other Inspectors sent down to investigate the application for a further loan for gas-works extension. This phrase was evoked after a tacit admission of the fact that, while sanction was obtained originally to borrow money upon the basis of plans that made provision for a holder with brick and puddle tank, the character of the work was changed in an essential particular by the substitution of an above-ground tank, which, as subsequent technical evidence showed, was the main cause of the mischief. With the institution of a new managerial *régime*, a not unnatural anxiety was manifested at the Council meeting on Tuesday last to close the record in relation to an altogether extraordinary municipal proceeding. There was no attempt to deal with Mr. Drury's report. But there is a stage in the matter yet to be reached, which the Corporation will probably find it will not be quite so easy to skim over. The Local Government Board have yet to say something, not merely as to the application for more money, but as to the somewhat strange manner in which the last loan was dealt with.

Meanwhile, Mr. J. Exton Holt, Assistant Engineer and Manager of the Stalybridge Corporation Gas-Works, has been appointed Manager of the undertaking, at a salary of £200 per annum, rising by annual increments of £15, to a maximum of £260; and he will enter upon his new duties on May 1, in succession to Mr. F. C. Humphrys, who, after spending nearly the whole of his official life in Ilkeston, has been appointed Assistant-Engineer, at £150 a year. Mr. Holt was selected from among seventeen applicants. He began his professional career in the accountant's department of the Stalybridge Gas-Works, afterwards spending six years in the works office under the late Mr. W. Carr, and for the last ten years acting as Assistant to Mr. W. Hill, the present Engineer and Manager.

Mr. MACDONALD, in briefly alluding at the recent Council meeting to the report of the Inspector upon the wrecking of the spirally-guided holder, directed attention to that part of Mr. Drury's judgment which emphasized the necessity for expert advice being obtained before any large expenditure is undertaken upon such works. The speaker fittingly described the Inspector's observations upon this important point as applying, not merely to Ilkeston, but to all other corporate bodies, and announced that the Council had now not been slow to act upon it in relation to the re-erection of the holder. Referring to the newly-appointed Manager, he observed that Mr. Holt came from a town where the output of gas was practically double that of Ilkeston, and under his guidance they hoped that the local undertaking would, as in the past, prove to be of a very profitable character. The Gas Committee, he added, had always been looked upon as a very ornamental body, whose only duty it was to lay a golden egg once a year, cackle over it as little as possible, and hand the egg over to the ratepayers. He thought it was scarcely fair that the Committee should have been attacked as it was at the last meeting in relation to the proposed appointment of Mr. S. Glover, of St. Helens, as the assessor of tar values under the Corporation. He regretted that the resolution then submitted in respect to the matter was withdrawn—especially as since Mr. Glover had been called in they had been enabled to increase their tar prices by 10s. a ton. The figures for the months from July to March showed that the tar value had increased from £1 8s. 6d. to £2—a rise which would bring them in the equivalent of a penny rate. It had been urged by one of their members (Mr. Smith) at the last meeting, that there were plenty of men in Ilkeston capable of doing the work, without going to St. Helens for one.

Mr. SMITH: I said there "might be."

Mr. MACDONALD thought the qualification "might be" made matters all the worse. It was in the nature of trying to draw a red herring across the path. After the whole question had been settled by the Committee, it was decided by the Council that it should stand over until the new Manager had been appointed.

Mr. SMITH: You have certainly given one side of the question, but what about the other?

Mr. CHADWICK said that in the interviews which took place with the various selected candidates, they were asked what they were obtaining for tar, and the average was 32s.; so that there must have been something valuable in the advice given by Mr. Glover.

Mr. SMITH denied that the increased price which had been obtained was more attributable to Mr. Glover than anybody else. It was simply due to the market price having risen. If credit was due to anybody, Mr. Humphrys should get it.

Mr. MACDONALD declared that if he gave the whole of the figures, they would make both Mr. Smith and Mr. Humphrys look ridiculous.

Mr. SMITH: But why should Mr. Glover want to advise the Committee without being paid for it? I cannot understand that.

Mr. MACDONALD replied that Mr. Glover did not advise the Committee. Mr. Glover happened to be present at one of the meetings, and upon hearing Mr. Humphrys say that he was getting £1 8s. 6d. a ton for tar, he remarked, "You ought to be making more than that." Mr. Glover's subsequent advice was given perfectly gratuitously, and therefore they ought to feel very much indebted to him. Mr. Smith had only endeavoured to aggravate the case.

Mr. SMITH: I suppose you think that will be another nail in the coffin of poor Mr. Humphrys.

Mr. MITCHELL expressed dissatisfaction with the view enunciated by Mr. Macdonald, who, he alleged, had omitted some of the most important points. Mr. Humphrys was just as well acquainted with the market as Mr. Glover. They were getting £2 5s. a ton now.

Mr. CHADWICK: Mr. Humphrys got that price after the advice tendered by Mr. Glover. Why did he not obtain it before?

Mr. SMITH: It is a pity Mr. Humphrys is not here to speak for himself.

Mr. MITCHELL said he could see no reason why they should provide Mr. Glover with another "soft job."

Mr. SMITH characterized it as most unjust to attack Mr. Humphrys in his absence, as some had been doing.

Mr. SUTTON urged the Council to endeavour to avoid indulging in so many personalities, and to try to do their duty to the ratepayers. Through what had taken place recently, the Ilkeston Corporation were being held up, not as a business assembly, but as a bear garden. It was quite time that such displays of feeling were stopped, and he donbted whether any ill or good thinking people liked afterwards to see in print things which were said in the heat of the moment.

Mr. MITCHELL: Some of us are like a lot of Quakers. We speak when the spirit moves us.

The discussion then terminated; and by Mr. Mitchell's concluding observation, the thought is prompted that the eagerly anticipated report of the Inspectors who recently visited Ilkeston, in regard to the proposed loan for gas-works extensions, may prove to be of a somewhat more "moving" character than many members of the Corporation appear to anticipate.

INCREASED GAS STORAGE FOR BURNLEY.

A Site to be Acquired.

The report of Mr. J. P. Leather, the Gas Engineer and Manager to the Burnley Corporation, on the need for increased storage capacity, which was given in the "JOURNAL" for the 11th ult. (p. 691), was considered by the Committee, who decided as follows: "(1) That, in view of the facts that an extension of the gasholders at the Stoneyholme Gas-Works would not provide a sufficient increase of gas storage capacity, and that in the opinion of the Committee it is advisable that provision be made for a future extension of the gas-making plant as well as for an immediate and sufficient increase of gas storage capacity, no extension be made to the existing gasholders at Stoneyholme; (2) that the Council be recommended to authorize the Committee to select and to carry out provisional negotiations for the acquirement of a site of sufficient area to allow of the erection of a gasholder of a capacity suitable to the gas undertaking and of future extensions of the gas-making plant." This recommendation came before the Council in the minutes of the Committee submitted last Wednesday.

Alderman EMMOTT, the Chairman of the Committee, in moving the confirmation of the minutes, said the Committee had for many years had under consideration the increasing of the storage capacity at the gas-works. At present there was storage for 2,800,000 cubic feet; but 200,000 cubic feet of this they might reckon for the water-gas plant. On several occasions just about Christmas time they used upwards of 4 million cubic feet of gas in one day; so that the Council would see there was just over half-a-day's supply in store. They had borrowing powers for raising the holders at Stoneyholme; the amount being £5000. But the Committee had considered the difficulties, and they were such that it was hardly worth while spending the money for any benefit they could get. The full extent of the alterations would only increase the storage by rather less than a million cubic feet. This meant that they would have to start on a fresh site, as they knew the town was being built up, and it was essential that the gas-works should be on the railway. The present works were on the canal side; and if

they could get coal by canal and rail it would be better still. The suggested new holder would have a capacity of 3 million cubic feet, and would cost £30,000. Besides the land—10 acres was suggested—there would be a 30-inch main to connect with Stoneyholme. The Committee asked the Council to give them the necessary powers to prepare for present and future needs in the way of gas-making and storage. They would want £40,000 before they had finished; but though the gasholder ought to be taken in hand as early as possible, it might be three or four years before all the money was spent. In the company of Mr. Leather, he had been looking round for a long time, and recently the Committee had inspected a certain site which it was thought might be suitable.

After some remarks, the recommendation was agreed to.

THE MANCHESTER STREET-LIGHTING EXPERIMENT.

Discussion of Pearce and Ratcliff's Paper in Glasgow.

It was mentioned in the "Electricity Supply Memoranda" last week that the paper by Messrs. Pearce and Ratcliff on the street-lighting experiments in Manchester, submitted to the Institution of Electrical Engineers on the 6th ult., and given in the "JOURNAL" the following Tuesday, was being discussed by the local sections of the Institution. In addition to those in Birmingham and Manchester, the Scottish Section have lately had it under consideration; and from a report of the discussion appearing in the "Electrical Times," we find that among those present were Mr. Alex. Wilson, the Chief Gas Engineer of the Corporation of Glasgow, and Mr. S. B. Langlands, the Superintendent of the Lighting Department, who offered the following remarks.

Mr. WILSON said he thought the results the authors had obtained by shading the globes at the bottom were most important. They acknowledged that gas gave a much steadier light than electricity; but they insisted that the candle power of the gas-lamp varied more than the flame arc. He agreed that there was deterioration in the mantles; but it was nothing like 50 per cent. Gas street lighting in London showed that there was not such a great deterioration in the mantles, because if the candle power fell below a certain figure, the suppliers were fined. With regard to the comparative cost of the two systems, it was evident that the arc lighting in Manchester had been efficiently carried out, whereas the high-pressure gas lighting had suffered from excessive leakage. As to simplicity, gas suppliers had automatic lighting and extinction of the lamps, and they had also lowering gear. Much of the so-called inefficiency of gas-lamps arose from the fact that these were not tuned-up to suit local conditions before being put in place. In Glasgow, they were not satisfied with anything less than 55-candle power per cubic foot of gas. He did not understand how the gas-lamps in Manchester had cost from £35 to £48, as in Glasgow they would want four or five lamps for this sum. The idea of testing street lighting seemed to be 3 feet from the ground and upwards. He thought it should be on the ground-level. The higher they went, of course, the better were the results yielded by the flame arc. On the other hand, to get rid of the glare from it they had to put it high up; so that on the ground-level the results were not so good as with gas lighting.

Mr. J. A. ROBERTSON said that in the Westminster contract it was specified that the maximum illumination was to be taken at angles of 20° and 45° respectively. It would be easy to obtain the maximum illumination at any particular angle by using a suitable kind of reflector or globe. A specification which called for a particular candle power at a given angle was open to abuse. A specification by which illumination could be measured was badly wanted.

Mr. LANGLANDS said his position was a detached one. Let electrical and gas engineers go on competing, for the result in either case would be for the good of street lighting. He thought the deterioration in gas-mantles had been exaggerated; 17 to 19 per cent. were more like the figures obtained from actual tests. He preferred laboratory tests to those made in the street.

Mr. PEARCE, in reply, said the candle power of London gas-lamps was maintained by frequent renewal of mantles; and efficiency in high-pressure gas lighting inevitably meant high maintenance costs, otherwise nothing better than 34 candles per cubic foot was likely to be obtained. The general results from the paper were that if arc lamps cost twice the amount stated, and gas-lamps were twice as efficient, even then the verdict would be in favour of electricity. He did not think that the effect obtained from uniform lighting was commensurate with the expense entailed.

GUILDFORD GAS-WORKS.

An Inspection by the Local Chamber of Trade.

An invitation was extended by the Directors of the Guildford Gas Company to the members of the local Chamber of Trade to visit the gas-works on a recent date, so that they might have an opportunity of witnessing the latest methods of manufacture. Nearly eighty accepted the invitation; and among those present were the Mayor (Mr. W. T. Patrick), Mr. F. W. Westlake (President of the Chamber), Mr. H. E. Smith (Chairman), and several members of the Lighting Committee of the Town Council. The visitors were met by the following Directors: Messrs. F. F. Smallpeice (Chairman), W. Stevens (Vice-Chairman), C. S. Heard, G. J. Jacobs, and C. Holden, the Secretary (Mr. W. Titley), and the Manager (Mr. P. C. Cleasby), who acted as guide, and explained the various processes.

In the last three years, the Company have spent over £20,000 in providing the most modern labour-saving plant, with the result that the works are thoroughly up-to-date in every respect. The coal-handling plant was inspected, and then the retort-house and telpher coke-handling plant. After an explanation of the carburetted water-gas system, attention was drawn to a tar dehydrating plant which has been recently erected, for the purpose of rendering the tar more suitable for road purposes. It is stated that there are annually produced about 160,000 gallons of tar, and all this is used locally. The visitors were particularly interested in the exhauster-house, where there were seen the compressors for use in connection with the high-pressure gas lighting which has proved such a notable success.

After the inspection, the visitors were entertained at tea in the Board-room. In proposing a vote of thanks to the Directors and to Mr. Cleasby, Mr. Westlake said they had all been much struck by the labour-saving machinery. As traders, they felt certain they had an excellent Company, who gave them a very good light at a rate which compared well with any town in the South of England. The installation of the high-pressure system had been a success, and the main streets were very well lighted indeed. Their thanks were due to Mr. Titley for carrying out this work with so little inconvenience.

Mr. F. F. Smallpeice, in responding, said the tradesmen were interested, as consumers, in the prosperity of the Company, because directly the Company made a profit beyond a certain point, it had to be divided in the proportion of five-sixths to the consumers and one-sixth to the shareholders. This was what the law provided in exchange for giving a gas company what was practically a non-competitive supply. The Company had made some little progress in the past. Ten years ago they sold, he thought, 147 million cubic feet of gas per annum, but now it had risen to about 187 millions. This increase of business had been secured in strong competition with the Electric Light Company. He was glad to see the Electric Light Company going ahead; they had worked hard, and had improved their position immensely. Still, it was rather remarkable that the Gas Company should also have made such a substantial increase in their business. They still hoped to progress and increase the business of the Company wherever there was an opportunity. They were rather looking to the trading community taking advantage of the high-pressure gas, which they believed would be of great advantage to them. The Directors had hopes that they would be able to reduce the charge for gas when the price of coal had reached a normal state; and they quite appreciated the necessity of giving a good article at a cheap rate.

THE DEVELOPMENT OF COLWYN BAY.

Progress of the Gas Undertaking.

[FROM A LOCAL CORRESPONDENT.]

Colwyn Bay is a watering-place which has made such rapid strides that already it is the premier resort in Wales from the point of view of both population and rateable value. New building estates are now being opened up, with roads formed and gas-mains laid; and all the indications point to a further and rapid development of the town.

The gas undertaking was acquired by the Urban District Council in 1901, at what was then thought to be a very high figure; the capital value equalling £1903 per million cubic feet of gas sold. The total cost, including arbitration, transfer, cost of Special Act, and mortgage debt, was £66,051. Two years later, a sum of £8210 was borrowed, to which was added in 1908 a further loan indebtedness of £17,000. In 1909, £4000 was borrowed, bringing the loans up to £95,260. Of this, £14,161 has been repaid; the outstanding debt on March 31, 1912, being £81,099. The rapid growth of population has necessitated a large capital expenditure on mains, meters, and cookers; and it is noteworthy that at the present time the capital debt per million cubic feet of gas sold has been brought down from £1903 to £1110.

Comparative figures for the decade ending 1912 are very interesting. The gas made increased from 39,590,000 to 80,135,000 cubic feet, the make per ton of coal used from 10,420 to 12,030 cubic feet, the gas sold from 34,691,500 to 72,360,500 cubic feet, and the quantity sold per ton of coal from 9134 to 11,013 cubic feet. The mains were increased from 15 to 30 miles; and the number of consumers from 1419 to 2865, and from 93 to 101 per mile of main. Turning to the financial side, the revenue has gone up from £9043 to £17,943, the expenditure from £5498 to £10,755, the gross profit from £3544 to £7188, the repayments of interest and sinking fund from £3058 to £5331, and the net profit from £486 to £1857, of which £752 was refunded to the general fund on street-lighting account.

Three years ago—for the twelve months ending March, 1910—prior to the advent of the present Manager (Mr. James Smith), the concern showed a loss of £111. Last year the net profit was £1960, after providing out of revenue about £800 for cookers, meters, services, and works extensions—representing a gross profit of £2760. The present policy of the undertaking was inaugurated with Mr. Smith's appointment in 1910; and the good results which have followed its adoption and maintenance are indicated by the figures given. In this connection, it is a pleasure to refer to a special report which Mr. Smith was requested to draw up, and in which he advocated 23 reforms. These included: The improving of the carbonizing results; the provision of additional washing plant; the enlargement of all 6-inch connections in the works to 12-inch; the allocation of as much work as possible to piecework; the testing of leakages in roadways; the systematic testing of all meters; hire-purchase of gas-cookers; the reduction of labour costs in cleaning and repairing cookers; the registration of meters, stoves, cookers, lamps, and mains and services; the reorganization of work in the distributing department; and monthly full reports in comparative form. The leakage account has been reduced from 14 to 6 per cent.; while the net cost of manufacture has been lowered from 17d. to slightly over 12d. per 1000 cubic feet.

It is now proposed to instal stoking machinery, which will secure a gross saving of £600 per annum, and a net profit of £300. The scheme comprises the lengthening of four beds of single retorts, 14 feet long, and the installation of the Guest-Gibbons charger and discharger, electrically worked, with all necessary equipment. The current will be generated by a steam-engine direct coupled to a dynamo of 25 k.w. capacity. The total cost of the extension and alteration under this head is estimated at £3200. A loan of £1000 is being sought for additional mains, and £2100 for meters and cookers.—F. G.

BARROW GAS-WORKERS' STRIKE.

Indiscreet Action Charged against Burnley Officials.

As the result of three of the employees of the Burnley Corporation Gas Department being sent to Barrow to assist the Corporation in continuing to supply gas during the strike, trouble was threatened at the Burnley Gas-Works. Though matters were amicably adjusted by the withdrawal of the men, the incident was under discussion for a long time at last Wednesday's meeting of the Burnley Town Council.

Mr. IRVING called the attention of the Council to what he termed "a regrettable incident," which, he said, showed a "certain amount of laxity of discipline;" and he asked the following questions of the Chairman of the Gas Committee: (1) By whose authority were Messrs. Pedder (yard foreman), Thompson, and Parsons, employees of the Gas Department, sent to Barrow to intervene between the Barrow Corporation and the gas workers on strike in that town? (2) If these men were sent, what inducement was offered them to go; and, in this case, did they absent themselves without leave? If not, who gave them the necessary permission, and on whose authority was the permission given? (3) Has the Gas Committee taken any action in this matter; and, if so, what are the findings of the Committee?

Alderman EMMOTT, the Chairman of the Committee, in reply, said he had gone into the matter with the officials at the gas-works, and had received a written statement from them. He then explained that the Borough Surveyor of Barrow called on Mr. Ross (the Borough Analyst of Burnley) early on the morning of Saturday in the Easter holiday week, and asked for help in working the carburetted water-gas plant. Mr. Ross communicated the Surveyor's request by telephone to Mr. Leather (the Gas Engineer), who, without due consideration, said he did not object to someone going, providing he could be got. Mr. Ross gave Pedder's address to the Surveyor, and later Mr. Ross called at his office, and quite by chance met Pedder and the Surveyor. Pedder was very much against going, but was over-persuaded. Thompson was mentioned as doing nothing, and was asked to go. Mr. Ross, owing to a misunderstanding, did not know Thompson worked for the Corporation, and thought he was one of the unemployed. Parsons by chance went into the laboratory, and Mr. Ross asked him if he would like to learn to work a Humphreys and Glasgow water-gas plant, as it was different from Burnley's. He said "Yes," and was sent till the next Monday to gain experience. No specific inducements were held out, and no terms were mentioned. The idea was to help with the water-gas plant, which was dangerous in inexperienced hands. He (the Chairman) hearing of the arrangements for the first time on Monday morning, at once telephoned and wired for the immediate return by motor-car of all concerned, so as to make a stoppage of work instantaneous. The men duly returned. The officials concerned had exceeded their authority, and committed an error of judgment, for which they had expressed their sincere regrets.

Mr. IRVING said he did not consider the Chairman's remarks an answer to any of his questions.

Alderman EMMOTT said the Borough Analyst was very sorry for what had happened. He had not had many dealings with men, and he (the speaker) did not think he knew as much about trade unionists as some of them did. Mr. Leather gave his consent unthinkingly; and he (Alderman Emmott) was satisfied he was taking more blame on himself than he need have done. He was too generous to blame anyone else. Both the officials were sorry for what had taken place, and they promised the same thing should not occur again. If they had consulted him, the men would not have had to go to Barrow. The Gas Committee knew nothing about it. When Messrs. Leather and Ross told him what had taken place, he said they had landed the Committee in a difficulty. The men must come back; and they were back by a quarter past five the same day.

After some remarks by councillors,

Alderman EMMOTT proceeded to answer Mr. Irving's questions specifically. He further explained that Mr. Leather telephoned to him at Darlington on the previous Saturday that there was to be a meeting in connection with the Gas Workers' Union, and asking whether it would be right if Mr. Ross and he sent a letter of apology. He replied, "Certainly. Make a full apology to them." He had not then seen the letter. When the matter was discussed in Committee, Mr. Leather apologized to them for himself and Mr. Ross.

Mr. LEES said he did not think any letter had been sent, for the reason that Mr. Ross had seen him and given him an ample apology, asking him to tender it to the local Secretary. He took the apology, and the Secretary accepted it. He thought the Council might take it that all-round the two officials concerned recognized their responsibility. They had expressed their regrets, accompanied by a promise that they would not do such things again.

The matter then dropped.

End of the Strike.

The strike of the employees at the Barrow Gas-Works has been settled. A week ago a deputation of the men declined the terms offered them by the Corporation that the strikers should be reinstated, and that there should be no victimization, but that it was impossible to grant a further increase in wages. Another deputation waited upon the Wages Committee, and the Mayor again assured them that every consideration would be given to old servants, taking the men on in order of seniority of service. The Corporation would not engage any more permanent men except in cases where they were already committed. If the men wishing to be reinstated would attend at the respective works and depôts, and record their names, addresses, and length of service, those for whom there were vacancies would be given employment as early as arrangements could be made; it being understood that the men, on returning, would work amicably with those already engaged. Permanent men re-engaged would be subject to one week's notice on either side. These are practically the same terms as were offered a week ago. The men on strike held a meeting, and subsequently the representatives intimated to the Corporation that the men would register their names immediately.

PENISTONE AND DISTRICT GAS SUPPLY.

Board of Trade Inquiry.

It was briefly mentioned in the "JOURNAL" last week that a proposal made by the Penistone, Thurlstone, and Oxspring Gas Company to extend their operations to several adjacent villages now unsupplied with gas was the subject of an inquiry by the Hon. T. H. W. Pelham, C.B., on behalf of the Board of Trade, to whom the Company have applied for a Provisional Order.

Mr. ELLISON appeared for the Company; Mr. CHARLES HODGKINSON represented the Urban District Councils of Penistone, Thurlstone, Hoylandswaine, Gunthwaite, and Ingbirchworth, and the Parish Council of Hunshelf, who opposed the application.

Mr. ELLISON explained that the Company was established as long ago as 1858, when, in a Special Act, the limits of supply were specified; the area being the townships of Penistone, Thurlstone, and Oxspring, and places adjacent in the parish of Penistone. The authorized capital was £10,000, in £20 shares; and the Company had power to borrow £2500. The charge for gas was fixed at 6s. per 1000 cubic feet. The dividend was not prescribed; but under the Gas-Works Clauses Act they would be entitled to 10 per cent. The quality of the gas was to be 10-candle power. Since its formation, the Company had progressed satisfactorily. Last year, the quantity of gas sold was 17,792,000 cubic feet—an increase of 8,800,000 cubic feet during the previous eight years; while the number of meters had gone up from 401 to 1135, and of heating apparatus, which did not exist in 1905, to 75. Penistone had 738 houses, Thurlstone 641, and Oxspring 93; giving a total of 1472 in these places, where gas was already supplied. The dividends paid by the Company were 5 per cent. from 1903 to 1906, 7½ per cent. in 1907 and 1908, 8 per cent. from 1909 to 1911, and the maximum of 10 per cent. in 1912. During this period, the price of gas was 4s. 2d. up to 1905, 3s. 9d. from 1906 to 1910, and 3s. 6d. in 1911 and 1912. The Company desired the Provisional Order on two grounds—first, in regard to the question of the limits of supply; and, secondly, to enable them to increase the capital. The original area of the Company was not very clearly defined; but, providing that the interpretation of the clause was that the adjacent places referred to must be within the parish of Penistone, there were only two to which the Company desired to extend their mains that were beyond the limit. These were Thurgoland and Hoylandswaine; and only the latter opposed the application—Thurgoland having agreed to the proposals, providing the price of gas was fixed at 3s. 8d. per 1000 cubic feet. This had been conceded, although 3s. 9d. was originally suggested. The additional capital was needed both to meet requirements in the old area and to provide for the extensions. It was proposed to increase the capital by the creation of £8000 worth of £20 shares, with powers to borrow £3500; also to adopt a sliding-scale for the price of gas, with a standard of 3s. 8d.—the dividend to be reduced 5s. for each 1d. paid above this sum, or increased by the same amount for each 1d. below. The present price of gas was 3s. 6d., and 2d. per 1000 cubic feet was allowed as discount for prompt payment.

Mr. HODGKINSON said the grounds of objection were that the new districts it was proposed to supply were only small places, and that it would not be profitable.

Mr. ELLISON said the matter had been fully considered, and the Company had no fear that the result would be an increase in the price of gas in the old area. Another objection was that the proposed capital was excessive for the present area; but the answer to this was that part of the money was required for the extensions. As to the question of the standard price being too high, he contended that, in view of the high cost of materials and labour, it was quite reasonable. Another objection dealt with the omission of the Company to supply gas to certain outlying parts of Thurlstone; and their contention was that, considering the small number of houses and the length of main that would be necessary, the undertaking would be unremunerative.

Mr. HODGKINSON interposed that Hoylandswaine had been dropped so far as the original Order was concerned.

Mr. ELLISON said the Hoylandswaine Council objected on the ground that they would be deprived of their right under the Public Health Act to supply the district; but they had never attempted or shown any desire to undertake the work.

Mr. *J. H. Brearley*, of Longwood, the Company's Consulting Engineer, gave particulars of the consumption of gas and the number of consumers. Of the amount applied for, he said £8300 was required for the area now supplied, and £3200 for extending the mains and providing meters, &c., in the proposed enlarged limits. He thought a standard price of 3s. 9d. per 1000 cubic feet would be reasonable; but the Company had now reduced it to 3s. 8d. by agreement with the Thurgoland District Council, whose opposition had been withdrawn.

Mr. *Robert Porter*, of Elland, agreed with the previous witness that 3s. 9d. was a reasonable standard price.

Mr. *Gerald Mitton* (the Manager of the works) and some residents in the proposed extended supply area also gave evidence in support of the application.

Mr. *William Newbigging*, called on behalf of the opponents, said an examination of the accounts of the Company for the past year led him to the conclusion that with a price of 2s. 11d. per 1000 cubic feet they could still pay a dividend of 10 per cent. He therefore thought 3s. 4d. would be a reasonable standard.

Representatives of the various District Councils having given evidence, the inquiry closed.

Birmingham and the South Staffordsh're Water Bill.—The announcement was made by Alderman J. H. Lloyd, when moving the adoption of the report of the Water Committee at last week's meeting of the Birmingham City Council, that there was no longer any necessity to move the resolution that the Committee be authorized to take all necessary steps in support of the petition of the Corporation against the South Staffordshire Water Company's Bill—the Company having decided to abandon the works to which the Corporation objected.

STANDARD STEAM COAL SPECIFICATION.

Two Committees, representing the principal London firms of coal contractors and the Associated Municipal Electrical Engineers of Greater London, have for some time had under consideration model specifications and conditions of contract for the purchase of coal by electricity works; and they have succeeded in drawing up a form of tender which is approved of by both Committees and the Society of Coal Merchants. The "Iron and Coal Trades Review" for the 28th ult. contained the principal clauses of the contract and the specifications, which are as follows.

Contract.

Quantity.—(8) The quantity of coal to be delivered shall be . . . tons; but the purchasers shall have the option of purchasing 5 per cent. in excess of, or 5 per cent. less than, such quantity within the period of the contract, such option to be declared before the expiration of three-quarters of the period of the contract.

Rate of Delivery.—(9) The coal shall be delivered in regular weekly, monthly, or quarterly quantities as follows:— . . . but the purchasers shall have the option of taking 10 per cent. in excess of, or 10 per cent. less than, such weekly, monthly, or quarterly quantity in any week, month, or quarter, provided that the total quantity so taken is within the limits described in clause 8.

Weights.—(11) The purchasers shall pay for the "out turn" weight of coal delivered as measured on the Council's weighing apparatus, excepting in so far as these weights may be affected by the conditions of the guarantee. In contracts where delivery is made in truck, and the purchasers cart the contents to works, the colliery weight to be accepted, unless the purchasers have the trucks re-weighed, full and empty, at receiving station.

Terms of Payment.—(12) The contractor shall render in duplicate upon his own and upon the purchaser's form a correct account of what is due to him by the seventh day of the month following the month in which delivery has been made; and the purchasers shall pay the contractor upon the certificate of the engineer within one month of the date upon which the correct account has been delivered to the purchasers.

Demurrage.—(16) In the case of coal sold in truck, the purchasers shall be allowed three clear working days from the date of arrival of trucks at the railway station or sidings, such date to be determined by railway companies' arrival note, after which demurrage shall be paid to the contractors at the rate of 6d. per waggon per day. In the case of seaborne coal, four clear days at or off wharf shall be allowed, after which demurrage shall be paid by the purchasers to the contractors at the rate of 1d. per ton per day.

Engineer's Decision.—(20) All decisions of the engineer shall be subject to the provisions of clause 23.

Strikes.—(22) In the event of a strike or lock-out of the workmen at the collieries or elsewhere, or of any circumstances whatsoever over which the contractor shall have no control, preventing delivery, the contractor shall not be required to deliver the description of coal herein contracted for during such strike, lock-out, or obstruction, and the quantity which would otherwise have been delivered shall be cancelled; but the contractor shall, if required by the purchasers, supply other coal approved by the engineer at a price to be agreed upon.

Arbitration.—(23) If at any time any question, dispute, or difference shall arise between the purchasers or their engineer and the contractor upon or in relation to, or in connection with, the contract, either party may forthwith give the other notice in writing of the existence of such question, dispute, or difference, and such question, dispute, or difference shall be referred to arbitration of a person mutually agreed upon, or, failing agreement, to some person appointed by the President for the time being of the Institution of Electrical Engineers. The award of the arbitrator shall be final and binding on the parties. . . . . This submission shall be deemed to be a submission to arbitration within the meaning of the Arbitration Act, 1899.

Specifications.

There are alternative specifications. A is for coal of a particular description, or "named" coal; while B is for coal guaranteed to have definite physical qualities as a fuel for steam-raising purposes.

The principal features of this latter specification for "guaranteed coal" are as follows.

The tenderer shall set out in his details the classes of coal for which he is tendering, corresponding with the classes referred to in the table of standards.

Testing.—(A.) A representative sample shall be taken on delivery from each or any consignment, and shall be divided and sealed in three air-tight vessels. The contractor shall be at liberty to be represented when the sample is taken, and shall be entitled to one portion thereof. The contractor shall have no opportunity at a later date of objecting to the manner in which the coal has been sampled.

(B.) Samples taken in the manner herein defined shall be taken from each consignment and tested by the purchaser, or, in the event of dispute, by a competent expert, who shall be approved from time to time by the purchaser, and whose fees shall be paid by the contractor if the purchaser's test is confirmed. The tenderer is invited to set out in the tenderer's details the names of three experts, either of whom he is agreeable shall be employed.

Bonus and Penalty.—No variation of the contract price shall be made or any variation from the standard not exceeding one-twentieth, up or down, of the figures given in the table of standards.

(*a*) If the calorific value exceeds the standard value in British thermal units per pound, the price per ton shall be increased in the same percentage ratio as the increase in the calorific value.

(*b*) If the calorific value be less than the standard value in thermal units per pound, the price per ton shall be decreased in the same percentage ratio as the decrease in calorific value: Provided always that the purchaser shall have the right to reject the whole consignment if the calorific value be more than 7½ per cent. below the standard.

(*c*) If the moisture be less than the standard percentage by weight, the weight of coal to be paid for shall be increased beyond the quantity actually weighed out by a percentage equal to the percentage decrease of moisture.

(*d*) If the moisture exceed the standard percentage by weight, the weight of coal to be paid for shall be decreased below the quantity actually weighed out by a percentage equal to the percentage increase of moisture: Provided always that the purchasers shall have the right to reject the whole consignment if the total moisture exceed one-and-a-half times the moisture given in the table of standards.

(*e*) If the percentage of small coal be less than the standard percentage by weight, the weight of coal to be paid for shall be increased beyond the quantity weighed out by a percentage equal to one quarter of the percentage decrease of small coal—percentages to be taken on the bulk and not on the standard.

(*f*) If the proportion of small coal exceed the standard percentage by weight, the weight of coal to be paid for shall he decreased below the quantity actually weighed out by a percentage equal to one quarter of the percentage increase of small coal: Provided always that the purchasers shall have the right to reject the whole of the consignment if the proportion of small coal exceed 25 per cent. by weight—percentages to be taken on the bulk and not on the standard.

Table of Standards to be Applied in Connection with Guaranteed Coals.

Moisture.		Small Coal Through.
A.—Bituminous Durham and Yorkshire.		
1.—Washed double nuts.		
13,250 B.Th.U.	8 p. ct.	¼-inch square mesh 15 p. ct.
2.—Washed single nuts.		
13,000 B.Th.U.	9 ,,	⅜ ,, ,, 17½ ,,
3.—Washed peas.		
12,750 B.Th.U.	10 ,,	½ ,, ,, 20 ,,
B.—Bituminous Scotch Washed Coals.		
1.—Washed double nuts.		
12,750 B.Th.U.	10 ,,	½ ,, ,, 15 ,,
2.—Washed single nuts.		
12,500 B.Th.U.	11 ,,	⅜ ,, ,, 20 ,,
3.—Washed peas.		
12,000 B.Th.U.	13 ,,	5/16 ,, ,, 20 ,,
C.—Semi-Bituminous and Pseudo-Anthracite Welsh-Washed Coals.		
1.—Washed large nuts.		
14,300 B.Th.U.	5 ,,	½ ,, ,, 15 ,,
2.—Washed small nuts.		
13,900 B.Th.U.	6 ,,	⅜ ,, ,, 20 ,,
3.—Washed peas.		
13,350 B.Th.U.	6 ,,	5/16 ,, ,, 20 ,,
D.—Bituminous Durham and Yorkshire Dry Screened Coals.		
1.—Double nuts.		
12,750 B.Th.U.	5 ,,	½ ,, ,, 17½ ,,
2.—Single nuts.		
12,500 B.Th.U.	6 ,,	⅜ ,, ,, 25 ,,
3.—Peas.		
12,250 B.Th.U.	6 ,,	¼ ,, ,, 25 ,,
E.—Bituminous Derbyshire and Nottinghamshire Dry Screened Coals.		
1.—Double nuts.		
12,250 B.Th.U.	9 ,,	½ ,, ,, 15 ,,
2.—Double screened small nuts.		
12,000 B.Th.U.	9 ,,	⅜ ,, ,, 20 ,,
3.—Pea nuts.		
11,500 B.Th.U.	10 ,,	5/16 ,, ,, 20 ,,
F.—Bituminous Leicester-Warwick and South Staffordshire Dry Screened Coals.		
1.—Double nuts.		
12,000 B.Th.U.	10 ,,	½ ,, ,, 15 ,,
2.—Double screened small nuts.		
11,750 B.Th.U.	10 ,,	⅜ ,, ,, 20 ,,
3.—Pea nuts.		
11,250 B.Th.U.	12 ,,	5/16 ,, ,, 20 ,,

British thermal units shall be ascertained on coal dried at 220° Fahr. for an hour by means of a Mahler bomb calorimeter.

Moisture shall be represented by the total loss in weight of the coal as delivered after air-drying and exposing to a temperature of 220° Fahr. for one hour.

The percentage of sulphur shall be based on the analysis of the coal "as received," and must not exceed 2 per cent.

The sieves used for determining the percentage of "small" shall be of square mesh, with openings in the clear to the sizes given.

Gas Profits and the Rates at Bradford.—In the course of an address on "Municipalization," recently delivered by Mr. Squire Deighton, who has been for many years a member of the Bradford City Council, he referred to the various municipal trading undertakings of the Corporation. Alluding to the Labour Party's cries for municipalization, he said that, though they shouted aloud on the success of the municipal tramways, they discreetly kept quiet on some other departments. Since the year 1901, the aggregate profits from the Gas Department had been £50,172. Four of the intervening years showed a loss amounting to £19,521; leaving a net profit over eleven years of £30,651, or an average of £2786 per annum, which was less than one-half per cent. on the present amount of the unpaid borrowings. If that day they had in a reserve or depreciation fund half the profits which had gone in the past to the relief of the rates, they could sell gas at 1s. 6d. instead of 2s. 1d. per 1000 cubic feet, and at the same time accumulate profits to further cheapen the supply. Throughout the coal strike, the price of coke had never been advanced in the city. They might easily have made £5000 in February, March, and April last year. They had advanced the scale of wages to the extent of £2706 in 1912, the year before to the amount of £1175, and at the next Council meeting another advance was to be put through. They placed coal contracts last autumn at a higher cost by £15,000; but, in spite of all these increased expenses, the Council would not raise the price of gas. The question was "Why?" The simple answer was "Electioneering."

NAPHTHALENE AS FUEL FOR EXPLOSION MOTORS.

A communication on this subject appeared in a recent number of the "Bulletin des Ingénieurs Civils." In the course of a lecture delivered by Mr. G. S. Sayner to the Harrogate and District Automobile Club reference was made to the French paper [see "JOURNAL" for March 4 last, p. 616]. We now give an abstract translation of some points in the latter, which are especially interesting in view of the importance attached recently to the subject of motor fuels.

The ever-increasing price of the various fuels in use for explosion motors is leading to a search for a sufficiently volatile hydrocarbon which will furnish the motive power at a low price. Experiments have been made with naphthalene collected among the products which pass over at about 172° C. in the distillation of tar oils. It is a white crystalline substance corresponding to the formula $C_{10}H_8$, of a density of 1·15, and melting at 79·7° C., with a vapour tension at 100° C. of 13·5 mm. of mercury. Its calorific power is 17,500 B.Th. U. per pound (that of benzol being about 18,000 and of essences of petrol 19,900). From the chemical point of view naphthalene forms part of the series of aromatic hydrocarbons covered by the general formula C_nH_{2n-12}. It contains 93·7 per cent. of carbon, and it is owing to this fact that it is harder to burn completely than the other hydrocarbons generally used. Very little tar oil is distilled in France; and the production of naphthalene is about 8000 tons. Germany produces some 175,000 tons, England 126,000 tons, and Belgium about 12,000 tons. The price of crude naphthalene that could be used in motors would be as follows: In the neighbourhood of Paris, 5s. 6½d. per cwt.; Antwerp, 4s. per cwt.; England, from 5s. per cwt.; Germany, 11s. 8d. per cwt. The usual practice is only to extract from tar oils the quantity of naphthalene necessary to prevent crystallization in the oils, and this accounts for the comparatively low production.

The advantages of the use of naphthalene in explosion motors are its low cost and the great safety in its manipulation. But there is the one great difficulty to be dealt with—that at ordinary temperatures naphthalene is a solid. Therefore it is necessary first to heat it beyond its fusion temperature. Besides this, it is necessary to add a large excess of air to ensure complete combustion, owing to the large proportion of carbon it contains. The low price allows a reduction of the net cost to about ·33d. per H.P. hour. Its safety consists in the non-inflammability; even when naphthalene is in the liquid state it will not easily catch fire from a flame, and if on fire can easily be extinguished with water. In case it should leak from the reservoir, the liquid would solidify immediately outside. The necessity of reducing it first to the liquid state certainly might give rise in some way or other to ignition; but the reservoir is of limited dimensions, and can be removed as soon as the desired stage is reached.

Naphthalene, continues the writer, has another advantage over petrols and other fuels previously used, in that it is a product of fixed composition, and will always be found to be the same. Hence, when once the compression and mixture have been fixed for a motor, it will always give the same results. Makers of motors using petrol and tar oils experience the greatest difficulty in obtaining comparative results, since these fuels have varying chemical compositions. In short, naphthalene motors have good prospects for application to cases where long periods of working are necessary—such (for instance) as in factories, cases of transport in general, agricultural work, &c. But the whole problem is at present only partially solved, and constructors have only succeeded in making carburettors, which, applied to ordinary oil motors, have given quite satisfactory results. Some of these the author proceeds to describe.

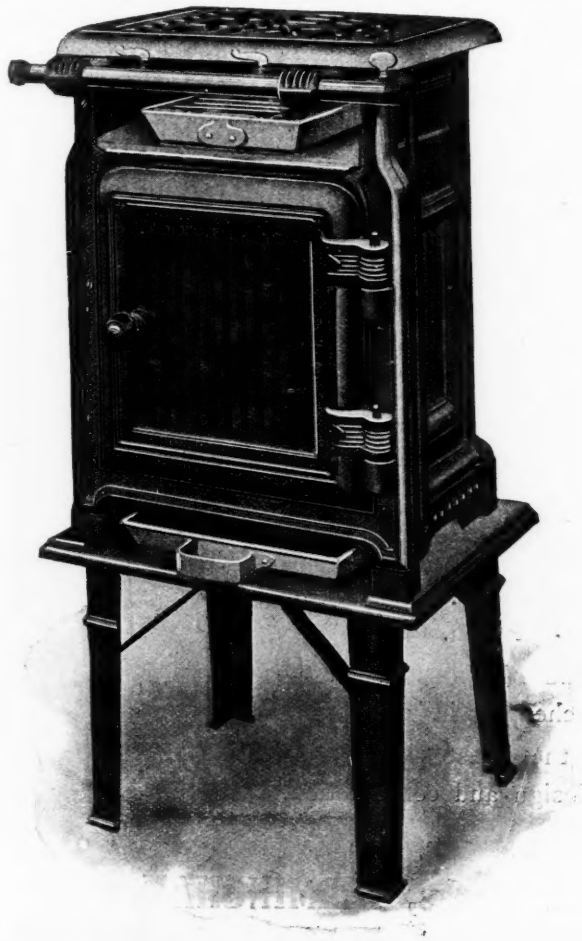
LEWISHAM INFIRMARY AND WORKHOUSE LIGHTING.

The Lewisham Board of Guardians considered on Monday last week a letter from the South Metropolitan Gas Company with reference to the installation of the electric light at the workhouse and infirmary, for which the Company had been invited to submit a tender. The letter set forth that it would be necessary, in order to avoid possible litigation, for the Company to enlist the co-operation of a third party to undertake the responsibility of providing the electrical plant and accessories, as distinct from the gas-engines. The Guardians, however, insisted that the installation must be the property of the Company. They had no doubt whatever as to their ability to generate electricity with a gas-driven plant, and to show a reasonable profit on the transaction; and, in the event of the price quoted by the Electric Company being in excess of their figures, there was nothing to prevent the Guardians from accepting the scheme as suggested by the Gas Company.

The South Metropolitan Electric Light and Power Company wrote offering to supply electricity as under: Lighting, 2d. per unit; heating, driving, and ventilating, 1½d. per unit. Under the suggested agreement, it was provided that the arrangement should remain in force for twenty-one years, but be determinable by the Guardians only at the end of the first seven or fourteen years by twelve months' previous notice in writing. Further, if at any time the Company supplied electricity elsewhere at a lower price, the Guardians were to be entitled to the reduced charge.

The Works Committee, who reported on the matter, recommended that the terms offered by the Electric Company be accepted.

Mr. Weeks directed attention to the letter from the Gas Company, which made it clear that the action of the Guardians in insisting that the installation must be the property of the Company had practically prevented them from tendering for the supply. He said that if the Company had been allowed to seek the co-operation of a third party, the price might have been brought down, as it had been, not only from



WITHIN THE RADIUS

of most Gas Undertakings there is usually a large number of flats and small dwellings.

The ordinary Gas Cooker may be too large for these and the circumstances demand the use of small Cookers such as "MAIN'S"

KENT

or

SUSSEX

which are just large enough to meet ordinary purposes and just small enough to fit into a corner or recess.

These Cookers embody all the features which make the "MAIN" lines pre-eminent for efficiency and economy.

May be mounted on adjustable stand.

R. & A. MAIN, LTD.

Gothic Works: ANGEL RD., EDMONTON, LONDON, N.

London Show-Rooms: 25, PRINCES ST., OXFORD CIRCUS, W.

56, Broad St., BIRMINGHAM; 13, Whitworth St. West, MANCHESTER; Gothic Ironworks, FALKIRK; 136, Renfield St., GLASGOW; 83, Old Market St., BRISTOL; 8, Exchange Place, Donegall St., BELFAST; 333, Queen St., MELBOURNE; and 12, Cunningham Lane, Pitt St., SYDNEY, N.S.W.

3½d. to 2d. per unit, but even to 1½d. This was a point worth bearing in mind.

The Committee's recommendation was, however, adopted.

Mr. Weeks drew attention to the first paragraph in the agreement into which it was proposed to enter with the Electric Light Company:

> "The consumers agree to light the whole of the infirmary and workhouse buildings by electricity, and to take the supply for such purpose, and such further supply as they may from time to time require for power, heating, and ventilating purposes from the Company."

He said he considered this a very one-sided arrangement. There were some places in their institution where they must have gas, and therefore he suggested that the clause should read that the Guardians should take only such necessary supply as they required. Under the clause, they might be compelled for seven years not only to light the buildings with electricity, but to use it for power, heating, and ventilating. He would therefore move that the clause be not accepted. The Chairman (Alderman Jackson) said he thought Mr. Weeks' objection would be met if the words "the whole of the "infirmary and workhouse buildings were eliminated. This suggestion was eventually agreed to, and the agreement approved.

At a later stage of the proceedings, the tenders for the installation work, such as wiring, &c., were opened. The highest was submitted by Messrs. Chapman and Co., of Lewisham, whose figures were £1800 for the infirmary and £1300 for the workhouse; and the lowest was from Messrs. W. R. Reynolds, Limited, of East Ham, whose tenders were £479 and £449. It was decided to accept the tenders of the latter firm, provided they entered into a bond for £500 and their references were satisfactory. It was also decided that a return should be prepared showing the cost of gas mantles, globes, and burners supplied to the infirmary for the year ended Sept. 30, 1912.

At the close of the meeting, Mr. Weeks gave notice of his intention, if re-elected on the 7th inst., to move the "rescission of the estimates and specifications" when the new Board meet.

Referring to the proceedings reported above, the "Kentish Mercury" last Friday said: "Mr. Weeks insisted on the complaint previously made that the matter has at the last moment been hurried through; and there seems reason to believe that he is justified in such criticism. One thing is abundantly clear—that the publicity given to the matter in the 'Kentish Mercury' and the action of the South Metropolitan Gas Company secured a reduction in the price for the supply of electric current from 3½d. per unit, the amount originally asked, to 2d. But having obtained such an important concession the majority of the Guardians 'dissemble their love' for the Gas Company by 'kicking them down stairs.'"

A record profit of £16,368 has been made by the Warrington Corporation gas undertaking, and there will be no increase in the rates.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

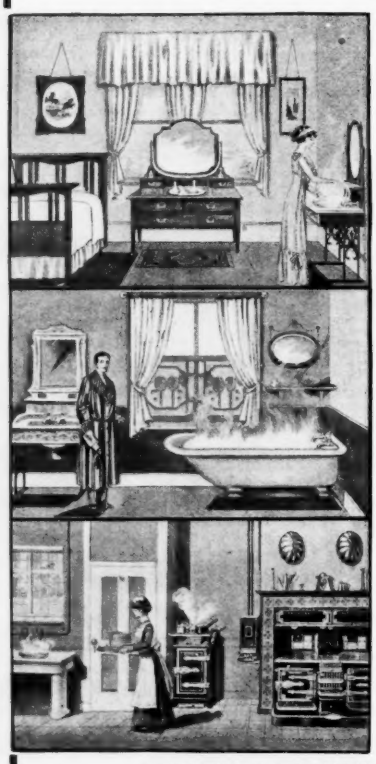
Saturday.

The attendance at the Thirtieth Informal Meeting of Scottish Gas Managers showed that it was in a most healthy condition. The long address of Mr. Samuel Milne, the President, formed excellent subject-matter for discussion, and would have done if the meeting had been quite twice the length. The large number of points dealt with allowed the members to discuss those in which they were interested, so that all had something to speak about. Mr. Milne has preference for continuous carbonization, in which he is probably at one with many other gas producers. He used an excellent expression, in referring to the capital expenditure which is justified for any apparatus that will save the labour of one man, when he said that £1000 was warranted. This is a figure one can easily remember; and it has the merit of being very closely accurate. However, it would not do to misunderstand or misuse this figure, because if the expenditure should involve the employment of machinery the cost of upkeep and wear and tear must be taken into consideration. There is no doubt that the vertical retort is not suitable for making gas of a high illuminating power; but with continuous working the quality should be uniform. In speaking of quality, one does not entirely refer to illuminating or calorific power, but also to uniformity of mixture of the various gases; and this makes for efficiency and satisfaction to the consumers who require the gas for heating purposes. The use of a ring pipe-line at increased pressure to improve weak points in the district of supply advocated by Mr. Milne is what has been in use for a number of years in Edinburgh, where it was installed by Mr. W. R. Herring. Upon this pipe-line, governors of the Foulis and Peebles type are fitted under the road, and the governing bells placed in pillar boxes on the footpath.

The gain of candle power found by Mr. Botley in gas which had been compressed in a cylinder, and the pressure afterwards reduced back to normal, is quite easily accounted for by the fact that the gas which passed out of the cylinder at the higher pressure had left behind it a quantity of the hydrocarbons, which were afterwards absorbed again by the gas as it came down to a lower pressure. The scheme of charges for "stand-by" meters is certainly ingenious; but one is rather tempted to ask whether the surveyors are provided with slide-rules or tables of logarithms to calculate out the sum to be charged the consumer. The period during which oil-gas vertical retorts have been in use without repairs at Pumpherston and Hopebank—namely, twelve and sixteen years—is certainly remarkable, in view of the tough nature of the shale residue, and the fact of the steam which is being constantly supplied to the retorts.

Mr. Mason's points regarding the British Commercial Gas Association were very pertinent, and it is hoped they may get to the ears of the various corporations and boards of directors of gas-works throughout

Never any Trouble with the



CALEFACTOR.

It uses the least gas.
It is the most compact.
Its inside passages are straight and clear.
It has no joints to leak.
It is not injured by the burning gas.
It is of the most lasting material —cast iron.
It stands the most wear.
It is cheapest in upkeep.
It is the latest word in scientific design and construction.

JOHN WRIGHT & CO., Essex Works, BIRMINGHAM.

Scotland. The Association is doing good work, and should certainly be supported, as all gas undertakings are receiving benefit from it.

With reference to Mr. Yuill's remarks regarding the damage done by the cyanides, there is no doubt that the wrought-iron and steel work in gas-works is suffering considerably. Many station meters have had to have the entire drum replated owing to parts of them being eaten away; and that this is not due to any fault in the plate is shown by the ends of bolts and set-screws which are projected into the inside of the meter. Some of these of an original diameter of $\frac{5}{8}$ inch have been found to have been corroded away to only about $\frac{1}{4}$ inch diameter. It ought to be ensured that the water in the meter, gasholder, and governor, &c., should be of an acid rather than an alkaline nature. This may prove a partial cure. Mr. Wilson's reference to the one quality of gas and one composition supplied in Glasgow, as compared with what can be done when carburetted water gas is supplied, was very pertinent. The reason of this was pointed out in detail in the opening lecture to the Eastern District of the Junior Gas Association at the Heriot-Watt College, Edinburgh, this session. It is a known fact among burner makers that the air required for the primary combustion in Glasgow is greater than in many other places.

Junior Associations would be well advised to set themselves out to receive just such lectures as that given by Mr. Chalmers at the meeting of the Juniors of the Eastern District on Saturday—always allowing that they can get gentlemen with sufficient knowledge and ability to do so. The meetings should be made opportunities for obtaining instruction in the various departments of the members' work; and, as far as possible, the instruction should be given by those who have made a study of the particular branch of work to be described. The gas-engine is not sufficiently understood by those who are responsible for the supply of gas; and there are, it is feared, few gas managers who could have remedied the troubles which Mr. Chalmers described. It is the gas which is blamed; and it is a great advantage if the gas supplier can point out what is really the cause—such as when a gas-engine is found with the valves opening at the wrong time and back-firing, which only requires the proper setting of the cam-shaft, and, in another case he cited, when the exhaust-pipe was found to be completely choked with carbon, and when cleaned full power was again obtained. Mr. Chalmers had the use of a sectional working model from the Heriot-Watt College, so that he was able to illustrate each part of his paper by ocular demonstration to the members. This emphasized the need of attending the reading of the papers, as those who only read the printed description missed not only this demonstration, but many remarks of Mr. Chalmers and a view of the small engine he had made, which was working upon the lecture table during the meeting.

Mr. Ferguson's paper was another plea for the better satisfying of the consumer; and in this connection it would be wise if gas suppliers would proceed to teach the consumer how best to use the fittings he has, and how best to regulate them, when it is necessary, in the same way as is being done by means of lectures and demonstrations of the use of gas for cooking. Not only is a satisfied consumer the best advertiser, as was pointed out by Mr. Geddes, but the knowledge of one consumer will be used, not only for himself, but also for his friends. Meters should be fitted in all show-rooms, to indicate the consumption, and also the exact cost per hour, of each stove, cooker, or burner being shown; so that there need be no complaint afterwards that the cost is greater than was anticipated. There is no worse advertisement than a consumer who thinks himself overcharged, or whose fitting or apparatus is costing him more then was stated when it was purchased.

The accounts of the Eastern Section show an increase in the balance in hand. It was decided to make the subscription 6s., instead of 5s., so as to include a free copy of the "Proceedings" to each member. The "Proceedings" are now sold separately at the price of 1s.

Dunfermline.—Important schemes for the development of the respective water supplies of the West of Fife and the Burgh of Dunfermline were under the consideration of the Commissioners under the Private Legislation Procedure (Scotland) Act in Edinburgh four days last week. Mr. C. E. Price, M.P., presided; and the inquiries were held in Parliament House. It was intimated that the Kirkcaldy and Dysart Water Order and the St. Andrews Burgh Extensions and Links Order were unopposed, and were withdrawn from the inquiry. Regarding the Order promoted by the Dunfermline District Committee of the County Council of Fife, it was explained that the area affected was 69,000 acres, and included the new Naval Base at Rosyth. The new reservoir would hold 950 million gallons, and the yield would be about 12 million gallons per day. The whole cost was estimated at £146,000, and no addition would be made to the rates. The new supply would be obtained from the upper reaches of the Devon farther up than Glenquey. The Order was formerly opposed by the Burgh of Dunfermline; but they withdrew their opposition, and promoted an Order seeking powers to expend £25,000 in laying pipes in the new Dunfermline extended area in connection with the new scheme. In the course of the evidence, it was apparent that there were elements of discord between the promoters of the two Orders; but these were ultimately brushed aside. Both Orders were eventually passed, subject to the adjustment of certain clauses. The Chairman expressed the view that Dunfermline had got an exceedingly good bargain in their arrangement with the District Committee. He thought it would ultimately be found that Dunfermline was getting the cheapest water supply anywhere in the country.

Edinburgh.—A peculiar point under the Insurance Act has emerged in connection with certain of the employees of the Edinburgh and Leith Corporations Gas Commissioners. There are a number of men employed at the rate of 10s. per week of seven days for the purpose of lighting and extinguishing stair gas. These men do not give their whole time to the work of the Commissioners; but when the Insurance Act came

CARRON

FOR a cooker that ensures life-long service with little or no cost for maintenance, you cannot overlook the merits of the CARRON type—the cookers *par excellence.*

CARRON Gas Cookers have for years *proved* their worth to the leading Gas Corporations throughout the land. Illustrated Catalogues, printed with your name, gratis and post free.

CARRON COMPANY INCORPORATED BY ROYAL CHARTER 1778

Works: CARRON, STIRLINGSHIRE, and at Phœnix Foundry, Sheffield.

into operation, they each had 4d. per week deducted from their remuneration. Under "Statutory Rules and Orders," the Insurance Commissioners have issued regulations showing that certain parties who give only part-time service are exempt from the Insurance Act contributions. The stamping of the cards has now been discontinued; but the Insurance Act Commissioners decline to make any refund of contributions. The men have a distinct hardship, as the sum involved is 11s. each for 72 employees. The site of the old Corstorphine Gas-Works, extending to about half an acre, with the buildings situated thereon, has been sold by auction, at the upset price of £350.

Elie.—The Town Council have resolved to introduce the pressure-wave system of street lighting, and to have it in operation for the next lighting seaon.

Inverkeithing.—At the monthly meeting of the Town Council—Provost Findlay presiding—Mr. Robertson submitted the motion of which he had given notice, to the effect that the Council adopt the procedure prescribed in regard to the adoption of the Burghs Gas Supply Act, and that, meantime, negotiations be entered upon with the view of acquiring the Inverkeithing Gaslight Company's undertaking. The Provost, after a lengthy discussion, pointed out that the whole Town Council bristled with directors and shareholders of the Gas Company. It was eventually agreed, on the motion of Bailie Wyllie, to call a special meeting of the Town Council in order to discuss the question.

Motherwell.—Mr. Frood moved, at the meeting of the Town Council, that the report of the Special Committee regarding the acquisition of the gas-works should be adopted. The recommendation was that steps be taken to acquire the works, in terms of the Act, at a price to be fixed by arbitration. Mr. Wilson seconded. After some discussion, it was recognized that some of the councillors were not so well acquainted with the subject as the members of the Committee, and it was suggested that a special meeting of the Council be called to consider the whole matter. Mr. Frood moved that the discussion be continued, to allow of this being done.

Newport.—The question of a new house for the Gas Manager has been discussed, and it was agreed that there was need for one of the men, as well as the Manager, to be permanently at the gas-works. The Town Council have therefore arranged to use the present dwelling house for the workman's residence, and decided to proceed with a new house for Mr. Black, at a cost of about £825. Ex-Bailie Young, in moving the recommendation of the Gas Committee, traced the development of the undertaking since it was acquired by the Council more than ten years ago, and, detailing the progress, said the consumers were reaping the benefit of the effective management. Looking to the heavy responsibility resting at present upon the Manager, who had no one in residence at hand in the case of emergency, it was felt that assistance should be provided.

Penicuik.—Three applicants have been chosen as a short leet to interview the Directors for the vacancy in the managership occasioned by the appointment of Mr. Williamson to Forres.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 5.

Sulphate of Ammonia.

The turn of the month has not introduced any new aspect in the situation of this article, and the tone of the market has continued quietly steady in the near position at prices current a week ago—viz., £13 18s. 9d. per ton f.o.b. Hull, £14 per ton f.o.b. Liverpool, and £14 2s. 6d. per ton f.o.b. Leith. There has still been a paucity of fresh direct orders coming forward, but the quantity required to fulfil previous engagements has been sufficient to maintain values. In the forward position, no sales have been reported by manufacturers lately, but they are still quoting about £14 per ton f.o.b. at the best ports for May-December delivery, while middlemen are said to be basing their calculations on about £13 15s. per ton for the same period.

Nitrate of Soda.

There is not a great deal of business passing in this article, but quotations on spot are fairly well sustained at 12s. per cwt. for ordinary and 12s. 1½d for refined quality.

LONDON, *April* 7.

Tar Products.

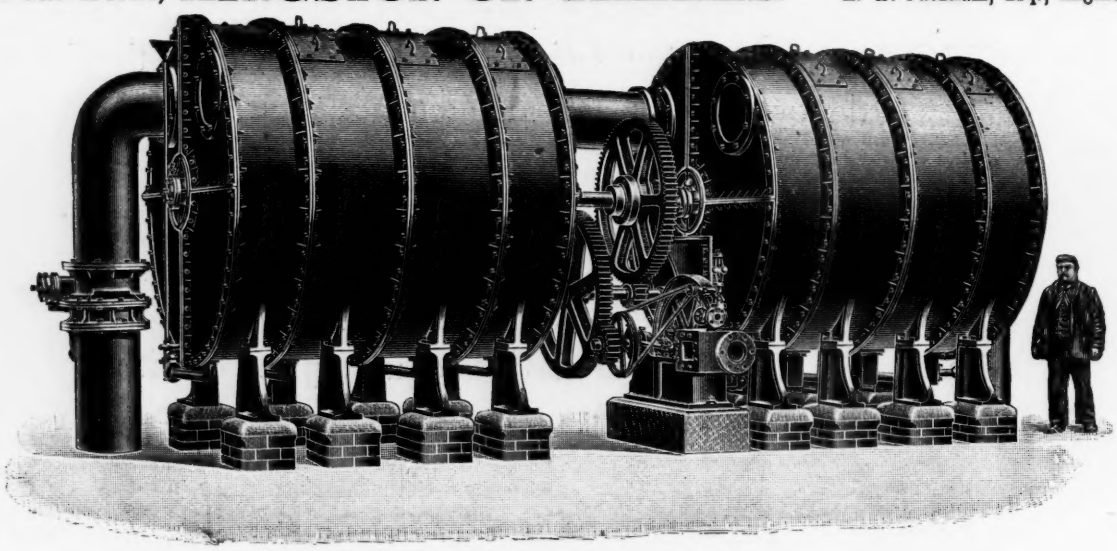
There is little alteration in the markets for tar products, and business on the whole is exceedingly quiet. Pitch maintains its price, though there are no fresh sales of importance to report. Ninety per cent. benzol is firm, and the inquiry is good for both prompt and forward delivery. On the whole, prices are slightly firmer. Solvent naphtha is steady, though business is somewhat difficult to negotiate. Heavy naphthas are in fair demand; but the price does not alter. Consumers will not purchase crude carbolic at present, and state that they are being offered at lower figures. Creosote is fairly firm; and there is a fair amount of inquiry.

The average values during the week were: Tar, 31s. to 35s. Pitch, London, 50s. to 50s. 6d.; east coast, 49s. 6d. to 50s.; west coast, Clyde, 49s. 6d. to 50s.; Manchester, 49s. to 50s.; Liverpool, 49s. 6d. to 50s. Benzol, 90 per cent., naked, London, 11½d. to 1s.; North, 11d. to 11½d.; 50-90 per cent., naked, London, 10d. to 10½d.; North, 10d. Toluol, naked, London, 10½d. to 11d.; North, 10d. to 10½d. Crude naphtha, in bulk, London, 5½d. to 5⅝d.; North, 5d. to 5½d. Solvent naphtha, naked, London, 1s. 0½d. to 1s. 1d.; North, 1s. to 1s. 0½d. f.o.b. Heavy naphtha, naked, London, 11½d. to 1s. f.o.b.; North, 10d. to 10½d. f.o.b. Creosote, in bulk, London, 3½d. to 3⅝d.; North, 3⅛d. to 3¼d. Heavy oils, in bulk, 3¼d. to 3⅜d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 7d. to 1s. 7½d. Naphthalene, £5 to £9; salts, 50s. to 55s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

ROTARY WASHER SCRUBBER.

Capacity 2,500,000 cubic feet per day,

For Gas-Works, KINGSTON-ON-THAMES. H. W. Packham, Esq., Engineer.



MAKERS:

R. & J. DEMPSTER, Ltd., MANCHESTER.

London Office:

165, GRESHAM HOUSE, OLD BROAD ST., E.C.

Sulphate of Ammonia.

This market continues quiet, and prices during the week have remained about the same. Outside London makes are still quoted at £13 5s.; Leith, £14 1s. 3d.; Hull, £13 18s. 9d.; Liverpool, £14; Middlesbrough, £13 18s. 9d.

Automatic Lighting in Liverpool.—The City Lighting Engineer for Liverpool, in his report for last year, states that satisfactory progress has been made with the installation of automatic controllers; 3010 having been fixed, against 2020 in the year 1911. The number now installed in the district is 7384, which is 38 per cent. of the total installation. It was estimated in the last report that this would reduce the wages bill to £16,776; but the total amount was £17,068. The increase, however, was due entirely to extra payments which could not be anticipated in making out the estimate, such as removal to new offices, increased rate of pay to workshop staff, and insurance contributions. The suburbs have now been completely installed with controllers.

Gas Exhibition at Ashton-under-Lyne.—An excellent exhibition of useful appliances is being held under the auspices of the Ashton Gas Company; the exhibitors including Messrs. Arden Hill and Co., the Davis Gas-Stove Company, John Wright and Co., Hardman and Holden, the Ashton Fittings Company, and the Gas Company. Mrs. Margaret Dunn is giving lectures and demonstrations on cooking by gas. In connection with the opening of the exhibition, Professor Harold B. Dixon delivered a short lecture, which was much enjoyed, on the "Nature of Gas-Flames;" while Mr. R. H. Clayton, of the Manchester Section of the Society of Chemical Industry, dealt with the smoke problem. Votes of thanks were accorded to these gentlemen, as well as to Alderman J. W. Kenworthy, who presided.

Metropolitan Water Board's Deficiency.—At the meeting of the Metropolitan Water Board last Friday, the Finance Committee presented a report on the deficiency in the water fund, and recommended that Parliament should be petitioned to permit the insertion in the Board's Various Powers Bill of provisions designed to remove all doubt as to the power of the Board to issue precepts upon the constituent authorities for amounts to meet the accumulated deficiency in the water fund. Mr. C. G. Musgrave, who moved an amendment that the recommendation should be referred back, declared that the proposals of the Committee were the most humiliating that had ever been submitted to the Board. The deficiencies had been accumulating for four years, and amounted to £1500 per week. He held that the passing of the Bill would be endangered by the new proposals, and that Courts of Law existed for the purpose of solving doubts. His opinion was that the precepts should be issued at once. The amendment was defeated and the recommendation carried. It was also decided that the issue of the precepts in connection with the deficiency should be deferred pending the result of the application to Parliament.

COAL TRADE REPORTS.

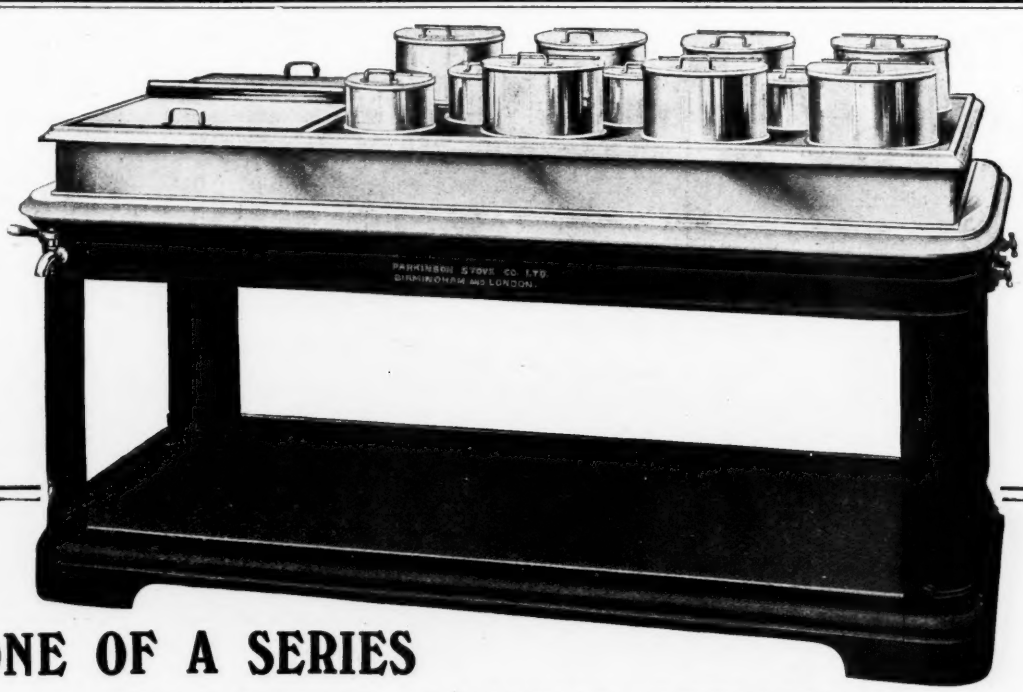
Northern Coal Trade.

The coal trade is very brisk in the north-east, and there is a stronger demand, especially for coals for prompt delivery. In steam coals, best Northumbrians are firm at from 17s. per ton f.o.b., with supplies for a month ahead at about 16s. Second-class steams are about 14s. 6d. per ton; and steam smalls from 10s. 6d. to 11s. 6d., also f.o.b. The output is a little below what is usual at this time, through irregular working. In the gas coal trade, there is now naturally a slightly reduced consumption. But large users are stocking coal, and there is a fair demand for shipment; so that the production is readily taken up. Best Durham gas coals are from 15s. to 15s. 3d. per ton f.o.b.; and second-class qualities are from 14s. 6d. For "Wear specials," about 15s. 9d. per ton f.o.b. is the current price. One lot of about 40,000 tons of best Durham gas coals has been sold, for delivery from May till near the end of the year, at about 14s. per ton f.o.b.; but the collieries generally ask higher prices for such a delivery. For occasional cargoes of gas coal, and for some small contracts for south country towns, the rates quoted for good gas coals are very near to those that are given above. The early opening-up of the Baltic trade, and a possible strike in Belgium are tending to stiffen gas coal prices for prompt delivery. Gas coke is steady, with the price near 16s. 6d. per ton; some heavy exports of gas coke being arranged.

Scotch Coal Trade.

All over the Scotch coalfield coal masters are very well employed in all departments, and prices, as a consequence, are steady. On Friday, on the Glasgow Coal Exchange, the following were the prices quoted: Steam coal, 13s. 6d. to 14s.; splint, 14s. 9d. to 15s. 3d.; ell, 13s. 6d. to 14s.; trebles, 13s. 9d. to 14s. 3d.; doubles, 13s. 6d. to 14s.; and singles, 13s. 3d. to 14s. 9d., f.o.b. Glasgow.

Divining for Water.—Last Thursday, some experiments in divining for water were carried out, in the presence of a Committee of investigators, at Guildford. There were three testing-stations—two near the river and one over a low service reservoir. Though the diviners were fairly unanimous in the location of underground water, they held varying opinions as to the depth at which it was to be found and the direction in which it flowed. In the riverside sites, it was stated that there was a practically unlimited supply of water. Most of the experimenters used hazel twigs; but one had an aluminium rod, and two others had provided themselves with clock-springs. In all cases the vibration of the rods when water in any volume was found was very great, and in several instances the hazel twigs broke off. Each of the diviners was accompanied by independent observers, who will make a report.



ONE OF A SERIES

OF SPECIAL COOKING APPLIANCES

designed for the

SOUTH MANCHURIAN RAILWAY CO.'S NEW HOTEL, DALNY, JAPAN.

THE PARKINSON STOVE CO., LTD., BIRMINGHAM & LONDON.

P.S.

Dangers of Petrol-Air Gas Lighting.

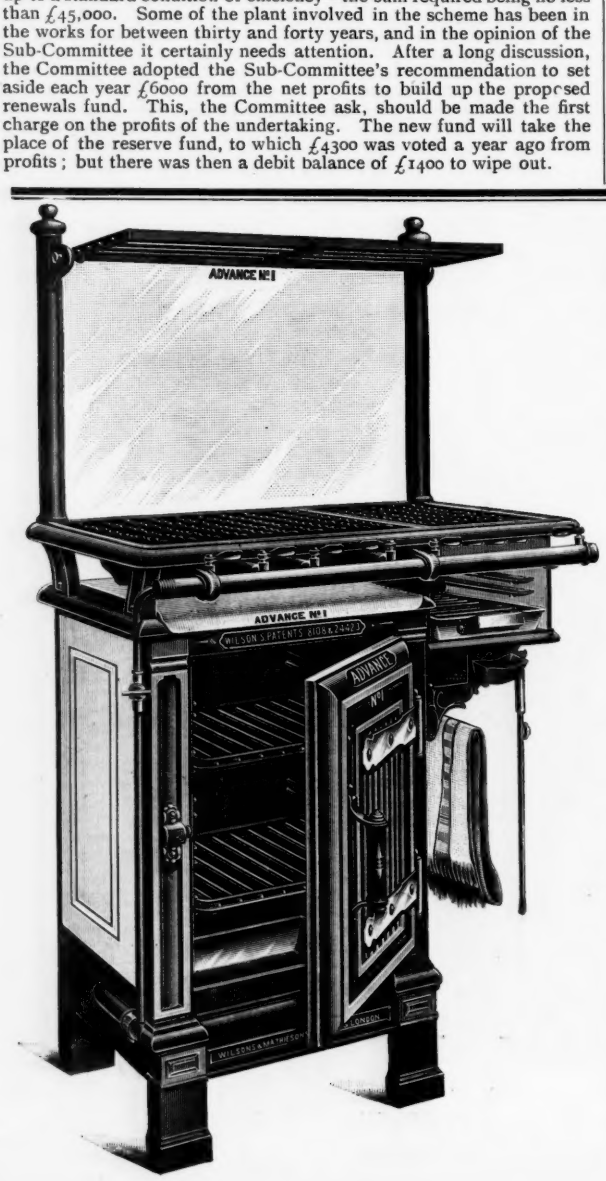
The inhabitants of Thurles have lately sustained a loss by the destruction by fire of their magnificent Confraternity Hall. This building was originally lighted by coal gas; but some years ago petrol-air gas was adopted for purposes of economy. The disaster occurred shortly after nine o'clock, when, while various amusements were going on, the light suddenly failed in the hall—a not infrequent occurrence, it appears. Attempts were made to set matters right, but the chamber containing the generating plant was found to be in flames. An alarm was given, and there was a general rush to the door. A stream of petrol dropped through the boards of the hall on to the furnace beneath. The fire spread rapidly, and the whole building, with the exception of the portion facing the street, was quickly enveloped in flames. The hose of the Urban District Council and the services of the volunteer fire brigade were requisitioned; but all efforts to extinguish the fire were unavailing. There was a sharp explosion soon after the outbreak, and the sound of another shortly after ten o'clock. The latter was stated by the local paper to have been an explosion caused by the disused gas-main; but, as a matter of fact, it was the noise of the falling of the heavy weights actuating the gas-generating plant. It was feared that the petrol store in the grounds of the building would take fire; but protective measures were taken at the outset. The flames rapidly destroyed all ignitable matter; but it was past midnight before the fire was extinguished. The destruction of the hall, which was built about thirteen years ago, is much regretted by the inhabitants, as there were many interesting associations connected with it; and it has been decided to rebuild it with all possible dispatch. It is to be hoped that considerations of economy will not militate against the selection of the best and safest illuminant.

Renewals Fund for the Rochdale Gas Undertaking.—An important decision was come to last Wednesday by the Rochdale Corporation Gas Committee. The gas-works reserve fund has for years been used for carrying out extensions and repairs, and has been reduced to a low figure. After the Local Government Board inquiry held in December in regard to the proposed development of the department, the Board wrote urging that a renewals fund of substantial amount should be built up. On Wednesday the Works Sub-Committee submitted the amount necessary to bring the whole of the older plant up to a standard condition of efficiency—the sum required being no less than £45,000. Some of the plant involved in the scheme has been in the works for between thirty and forty years, and in the opinion of the Sub-Committee it certainly needs attention. After a long discussion, the Committee adopted the Sub-Committee's recommendation to set aside each year £6000 from the net profits to build up the proposed renewals fund. This, the Committee ask, should be made the first charge on the profits of the undertaking. The new fund will take the place of the reserve fund, to which £4300 was voted a year ago from profits; but there was then a debit balance of £1400 to wipe out.

Sales of Stocks and Shares.

The sale of gas and water stocks conducted by Messrs. A. & W. Richards at the Mart, Tokenhouse Yard, E.C., last Tuesday, included a new issue of capital by order of Directors. It consisted of 500 £20 preference shares (4½ per cent.) in the Gravesend and Milton Water-Works Company. It was pointed out in the particulars that these shares were a full trustee investment; and they were all sold at £21 to £21 5s. each. The remaining stocks and shares were offered for sale by order of executors. The first lots were £1250 of consolidated stock of the Hornsey Gas Company, ranking for a standard dividend of 7 per cent., but carrying 9¾ per cent., and it fetched from £185 to £186 per £100. Next came a small quantity of 10 per cent. "A" stock of the Company, carrying 12½ per cent. dividend; and it was sold at the rate of £240 per £100. A few original £10 shares in the North Middlesex Gas Company, the dividend paid on which has for some time been 10½ per cent., were bought for £21 each. Some original ordinary 10 per cent. consolidated stock of the Brighton and Hove Gas Company, carrying 11 per cent. dividend, realized from £207 10s. to £210 per £100; a similar quantity of "A" ordinary 7 per cent. stock, carrying 8 per cent., was sold at the rate of £153 to £154 per £100. A few £5 original 10 per cent. shares in the Herne Bay Gas Company fetched £9 7s. 6d. per share; some additional 7 per cent. shares, of similar nominal value, being sold at £6 10s. each. A parcel of £1 shares in the Hungerford Gas Company, carrying 5 per cent. dividend, were purchased for 17s. 6d. apiece. The final lots consisted of 5s. fully-paid shares in the Broken Hill Water Supply, Limited, and they fetched £1 to £1 1s. each; the purchasers taking all dividends and any bonuses (3s. per share has already been paid this year) from the 1st inst. During the past week, stock of the Portsea Island Gas Company realized the following prices at sales by auction: £50 "A" shares, £146; £50 "B" shares, £139; £50 "C" shares, £128 to £129; and £14 11s. 8d. of 5 per cent. stock was sold for £18. Shares in the Portsmouth Water Company fetched the following prices: £10 shares, original issue, £25 15s.; £5 shares, 1868 issue, £12 15s.; £5 shares, 1883 and 1879 issues, £8 15s.; and £5 shares, 1898 issue, from £6 5s. to £6 7s. 6d.

Fractured Gas and Water Mains at the West End.—Early last Sunday morning, about 60 yards of Brewer Street, a thoroughfare leading from Piccadilly into Regent Street—collapsed, and a little later the roadway fell in with a crash of crumbling asphalt and concrete, and the breaking of two water and three gas mains. There was a large escape of gas, and the street was deluged with water until the supplies were cut off. At one side of the street, a new hotel is being built; and the road appears to have given way owing to the excavations. The only occupied house in the street is tenanted by Mr. Bird, a dairyman, who said the house shook, and was almost immediately filled with gas. He ran downstairs, but was overcome by the gas, and was found lying unconscious in the hall.



COOKER DE LUXE.

THE WILSON "ADVANCE."

(Made in Three Sizes—Nos. 1, 2, & 3.)

FROM a Practical and Scientific standpoint the perfect Stove for Cooking with Gas, and the Cooker De Luxe for the Modern Home.

16 Distinct and Novel Devices mark its model construction, attractive appearance, and extreme utility.

THE "ADVANCE" in your Showroom will Advance your interests greatly.

Descriptive Leaflets and Prices on Application to Manufacturers.	WILSONS & MATHIESONS, LTD., Carlton Works, ARMLEY, LEEDS. *London Showrooms:* 76, Queen Street, CHEAPSIDE, E.C.

Antwerp Water-Works Company.

In the absence through illness of Mr. Easton Devonshire (who we regret to say has since died), Mr. George Evans presided at the meeting of the shareholders yesterday week. The Directors had an excellent report to lay before them ; and there was satisfaction on all hands with the results. The income for the year amounted to £101,994, as compared with £96,083 for 1911 ; and after deducting working expenses, the cost of laying on services, and London expenses, there was left a balance of £73,122. To this were added the undivided profit of £4550 brought forward from the last account, and interest on investments £1262—making a total credit of £78,936. Against this had been charged debenture interest and income-tax for 1912 ; the interim dividend of £18,000, at the rate of 12 per cent. per annum, paid on Sept. 30, 1912 ; the transfer to the sinking fund for redemption of debentures of £7370, and for that of the share capital, £6250 ; the Directors' extra remuneration £3140 ; and the balance of the expenses of the issue of debentures, after deducting the commission received from the Phœnix Assurance Company, £77. The sum of £34,988 was then left, out of which the Directors recommended that a balance dividend be paid at the rate of 12 per cent. per annum, free of income-tax, absorbing £18,000, and making a total dividend of 12 per cent. for the year ; that £8955 be transferred to special reserve (maintaining the total of that account at £20,000), and that the balance of £8033 be carried forward. During the past, year further debentures to the amount of £61,700 were placed to meet the expenditure on new works ; leaving a balance of £8300 still to be issued. The report and accounts were adopted on the motion of the Chairman, seconded by Mr. John Kennedy, as well as the recommendations. The retiring Directors and Auditors were re-elected. The Company's Manager (Mr. V. Van der Taelen) was present, and made an interesting speech.

Gas Question at Frodingham.—A special meeting of the Brumby and Frodingham Urban District Council was held last Wednesday to discuss a resolution to promote a Gas Bill. Mr. W. Woodley presided, and the Clerk (Mr. Sowter) read a letter from the Local Government Board with reference to an inquiry recently held at Scunthorpe. It was stated therein that the Board had come to the conclusion that there was no necessity for the establishment of two gas-works for the area proposed, and that it was advisable, in the circumstances, that some agreement should be come to between the Scunthorpe and Frodingham Councils. The Board thought the suggestion made on behalf of the Frodingham Council for the appointment of a Joint Board should receive the careful consideration of the Scunthorpe Council, in whose area the present gas-works are situated. If necessary, the Board would arrange for the attendance of Mr. Ekin, one of their Inspectors, to consider the matter with the Councils. A resolution was passed that the Scunthorpe Council should be approached, and, failing the arrangement of satisfactory terms, that the attendance of the Inspector should be asked for.

Electric Light Losses in Limerick.—During a discussion on the rate estimate at a meeting of the Limerick Town Council, Mr. O'Brien said that since the electric lighting works were started they had paid £14,000 out of the improvement fund to meet the losses incurred. Electric light was only used by 300 out of the 7000 hereditaments ; so that 6700 people were asked to pay £1400 or £1500 to give that small number a luxury.

Bye-Product Coke-Ovens in South Wales.—An installation of bye-product coke-ovens which is to be erected by the United National Collieries, Limited, at Risca, will comprise a 2000-ton Coppée coal washery to treat the small coal from the Risca and Nine Mile Point Collieries. Waste-heat ovens to the number of 54 are also to be installed, together with bye-product plant for the recovery of tar, sulphate of ammonia, and crude and rectified benzol ; and a new type of coke screening and loading machine is being adopted in order to reduce the labour charges. The waste gases will be taken under a range of Babcock and Wilcox boilers.

Belfast Gas Undertaking.—Speaking on behalf of the Gas Committee at the April meeting of the Belfast City Council, Mr. Squire said the Council need not look forward to such substantial sums as they had been receiving in aid of rates ; and he urged that they must go carefully in connection with the gas undertaking. The gas-works had been operated during the last few months at a greatly increased cost. They had come to the end of their three years' contract for oil, and were just now buying as sparingly as they could. Instead of $1\frac{11}{16}$d. per gallon, which was the old contract price, they were paying $4\frac{1}{4}$d. They had bought half a cargo at this figure, and could have re-sold at a profit, before the sale was completed ; the price having risen to 5d. If this price continued, it would mean an extra expenditure for the year of £30,000 for oil alone. The advance in the price of coal would for this period come to about £10,000.

Sequel to a Gas-Workman's Injury.—His Honour Judge Lindley, at the Tiverton County Court, was recently asked to record an agreement under the Workmen's Compensation Act, between the Tiverton Corporation Gas Department and a labourer named John Hemborough. Mr. W. J. Robinson, representing an insurance company with whom the Corporation employees are insured, said that Hemborough had agreed to take a lump sum of £20 in compensation. He was 67 years of age, and had been employed at the gas-works for 34 years. Some months ago, he was taken off the job of lamplighting, for which he was thought to be too slow, and was employed as a labourer in the works. There a trolley ran over his hand, and two fingers were crushed. For a time he was totally incapacitated, but was now able to do light work, though that at the gas-works was too dangerous. He had been paid 9s. a week since the accident. His Honour said it seemed probable that the man would have great difficulty in getting work, and the £20 would last only a year. To give him 5s. a week until he was qualified for an old-age pension would cost only £40, and he did not think less than this would be reasonable. The agreement, therefore, was not recorded.

HOT WATER AT ALL TIMES.

"Spiral Circulator," with Manhole, for Hard Water.

The WILSON "SPIRAL CIRCULATOR."

(Patent No. 28,996)

For HARD or SOFT WATER.

UNIQUE CONSTRUCTION:

STRONG COPPER THROUGHOUT IN ONLY TWO PIECES—outer casing and inner chamber—and ONLY TWO BRAZED JOINTS.

SPECIAL FEATURES:

UNLEAKABLE and INDESTRUCTIBLE
INTERNALLY HEATED.
COMPLETE ACCESSIBILITY—to both Water Chamber and Flue-Way.

Complete Descriptive Pamphlets from the

MANUFACTURERS:

WILSONS & MATHIESONS, LTD.,
Carlton Works, Armley, LEEDS.

London Showrooms:—76, Queen Street, Cheapside, E.C.

Coke-Oven Gas in Belgium.—According to the Engineering Supplement to "The Times," the municipal authorities of Liège, having decided to exercise their right to take over the privately-owned gas-works which at present supply the town, have been considering the method of manufacture to be followed in the future, and have come to the conclusion that a saving of 1 c. per cubic metre (2¾d. per 1000 cubic feet) could be effected on the present cost, which is 4·75 c., by using coke-oven gas. On a year's working, this would mean a supplementary profit of about 240,000 frs.; the present output of gas amounting to 24 million cubic metres. Tenders are being invited either for the supply of only 12,790,000 cubic metres of gas from coke-ovens, the remainder being supplied by the existing works, or for the entire bulk of 24 millions. Opinion is divided as to the possibility of obtaining the expected saving of 1 c. per cubic metre. It is pointed out that in the 45 towns and communes of the Ruhr district using coke-oven gas, the prices vary from 3·1 c. to 5 c. per cubic metre; and in the Liège district it will be necessary to import Ruhr coal.

Margate Water-Works Extensions.—At a recent meeting of the Margate Town Council, the Water Committee reported that, owing to the increasing consumption of water, it had become necessary to increase the pumping plant at Wingham. Accordingly in September last tenders were invited for the following: Three million gallon plant per 24 hours, running at 22 revolutions, but capable of delivering 3½ million gallons when running at 25½ revolutions per minute; one high-service pumping-engine for outlying high-level parishes; one steam winch for well work; one hand travelling crane; one steam barring-engine. A Committee of Inspection visited plant erected in various places by several firms; and, after further consideration, they invited fresh tenders from three selected firms, on a steam consumption basis not exceeding 12 lbs. per pump-horse-power per hour. The tenders and replies to questions having been carefully considered, the Committee recommended that Messrs. Hathorn, Davey, and Co.'s tender at £11,710 be accepted; the work to be completed within sixteen months from the receipt of order. The recommendation was agreed to.

The Lights of Buenos Ayres.—According to the "Review of the River Plate," the lighting of Buenos Ayres is undergoing a steady transformation, and the kerosene lighting in the outlying districts is being replaced by gas and electricity. The gas lighting of the city is in the hands of the Primitiva Gas Company, who have actually in service 18,037 lamps, and in four years' time this number will be increased to 20,000, as the Company have made a contract with the authorities similar to that of the Compania Alemana for a period of fifteen years. The public electric lighting consists of 2531 arc lamps, with an equivalent of 3,531,000-candle power. In accordance with the recent arrangement between the Municipality and the Compania Alemana de Electricidad, the Company have agreed to instal, at their cost, 4000 arc lamps at the rate of 1333 per annum, so that in 1915 the city will have 6500 arc lamps in service, with an equivalent of 6,500,000-candle power. There are also 2181 alcohol lamps and 3650 kerosene lamps.

Municipal Trading Profits at Dewsbury.—Speaking at a meeting of the Dewsbury Town Council last Thursday, Sir Mark Oldroyd said a minute examination of the financial situation of the borough showed it to be worse than he had described in a previous portion of his speech. On top of the rate of 9s. 6d. in the pound, they were taking for the relief of rates £10,000 gas profits, £2000 water profits, £500 from the Electricity Department, and £500 from the markets—a total of £13,000, which was equivalent to a rate of 2s. 2d. He noticed that in Bradford £33,000, and at Halifax £20,000, were being taken from trading profits; and these amounts were small in comparison with Dewsbury, when they had regard to the much greater rateable value. He did not say there was no justification for the appropriation of these profits for the relief of rates; but there was very little. The main intention of Parliament in allowing municipal enterprise was that the convenience and advantage of the public should be secured; and if this were not done, a great injustice was inflicted. If profits amounting to 2s. 2d. in the pound from the municipal undertakings had not been available, the rates at Dewsbury would be 11s. 8d. in the pound.

GAS COMPANIES' STOCK AND SHARE LIST.

The Stock Exchange has had but a poor week—a prey to the bewildering uncertainties of the immediate future in the Near East. Business consequently was dull and devoid of spirit; the necessity of caution being recognized so long as no trustworthy forecast of a solution of the Montenegrin situation could be descried. Markets, however, did not crumble to pieces, as they might well have done in some circumstances, but showed their healthy condition by moderate movements as influences impelled them; and prices have been well maintained on the whole. An easier attitude of the Money Market lent a helping hand. The opening on Monday was prudently reserved; the outlook in the East being obscure. But rather more hopeful views obtained later; and the retrograde movement of the morning was reversed to a moderate extent. Consols were firm, and Rails made some small advances. Tuesday was very slack, and markets mostly gave way. Consols receded ¼, and Rails, after a fair opening, weakened and closed lower; but American improved. Wednesday was quiet and spiritless, oppressed by accumulating difficulties in the East. Government issues ruled weaker, and prices of Rails were lower; but American again were a welcome contrast. No improvement was to be discerned on Thursday, and markets remained in suspended animation. Only Rails, however, showed an appreciable fall. Friday was dead quiet. Government issues were featureless; but the usual selling weakened Rails a little. Saturday closed the week much the same as it had begun; all eyes being turned to the East with Scutari as their cynosure. The general tone was weak, and Consols fell ⅛, closing at 74 to 74¼—a fall of ¼ in the week. In the Money Market, the downward movement in rates progressed, and the market closed easy. Business in the Gas Market was not remarkable in any way. The aggregate of operations mounted up to a pretty fair average, and prices showed very little variation from the week before, though such changes as did occur were somewhat capricious and irregular. In Gaslight and Coke issues, the ordinary was as active as usual, and prices at which it actually changed hands were rather better; but the quotation was left unchanged. The figures ranged from 102 to 103. In the secured issues, the maximum realized from 80½ to 81, the preference 95½ and 96 (a fall of 1), and the debenture from 73 to 74. South Metropolitan was very quiet and unchanged; transactions being within the limit of 102 and 103½. In Commercials, the 4 per cent. marked 105½, and the debenture 71⅛ and 71¾. Among the Suburban and Provincial group, Alliance and Dublin was dealt in at 76½ and 79, Brighton original at 208, and ditto ordinary at 152½ and 153 (a rise of 1 in each issue), British at 45, Lea Bridge at 120 to 122, South Suburban at 118, and Tottenham "B" at 115½. On the local Exchange, Newcastle marked 99—a fall of 1. In the Continental companies, Imperial changed hands at 171 to 173½, ditto debenture at 86½ and European at 17⅞—a fall of ¼. Among the undertakings of the remoter world, Bombay marked 6⅞, Buenos Ayres debenture 93, Cape Town preference 4¾, Monte Video 13½, Ottoman 8⅛, Primitiva 6¾ and 6 15/16, and ditto preference 4 15/16 to 5 1/16.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,561,868	Stk.	Oct. 11	5	Alliance & Dublin Ord.	75–80	..	6 5 0
374,000	,,	Jan. 16	4	Do. 4 p.c. Deb.	83–86	..	4 13 0
280,000	5	Oct. 11	7½	Bombay, Ltd.	6⅞–7	..	5 7 2
50,000	10	Feb. 27	15	Bourne-mouth Gas & Water	10 p.c.	28½–29½	..	5 1 8
					B 7 p.c.	15½–16½	..	4 6 8
					Pref. 6 p.c.	13½–14½	..	4 4 3
75,000	10	,,	6					
380,000	Stk.	Feb. 27	14	Brentford Consolidated		260–265	..	5 5 8
330,000	,,	,,	11	Do. New		203–205	..	5 7 4
50,300	,,	,,	5	Do. 5 p.c. Pref.		113–115	..	4 6 11
206,250	,,	Dec. 12	4	Do. 4 p.c. Deb.		94–96	..	4 3 4
217,380	Stk.	Feb. 27	11	Brighton & Hove Orig.		206–211	+1	5 4 3
244,200	,,	,,	8	Do. A Ord. Stk.		151–154	+1	5 8 11
530,000	20	Mar. 28	12½	British		44–45*	..	5 11 1
120,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. Stk.		99–91	..	4 7 11
245,771	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.		91½–93½	..	4 5 7
100,000	10	—	—	Cape Town & Dis., Ltd.		2–3	..	—
160,000	10	—	—	Do. 4½ p.c. Pref.		4–5	..	—
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.		78–83	..	5 8 5
157,150	Stk.	Feb. 13	5	Chester 5 p.c. Ord.		107½–109½	..	4 11 4
1,513,280	Stk.	Feb. 27	5/9/4	Commercial 4 p.c. Stk.		104–106	..	5 3 1
560,000	,,	,,	5½	Do. 3½ p.c. do.		101–103	..	5 3 6
475,000	,,	Dec. 12	3	Do. 3 p.c. Deb. Stk.		71–73	..	4 2 2
800,000	Stk.	,,	4	Continental Union, Ltd.		84–87	..	4 12 0
200,000	,,	,,	7	Do. 7 p.c. Pref.		130–132	..	5 6 1
492,270	Stk.	—	5¾	Derby Con. Stk.		124–125	..	4 12 0
55,000	,,	—	4	Do. Deb. Stk.		103–105	..	3 16 2
1,002,180	10	Jan. 16	10	European, Ltd.		17⅜–18⅜	–¼	5 6 8
16,415,840	Stk.	Feb. 13	4/17/4	Gaslight and Coke	4 p.c. Ord.	101¼–103½	..	4 14 2
					3½ p.c. max.	80–83	..	4 4 4
					4 p.c. Con. Pref.	95–98	–1	4 1 8
					3 p.c. Con. Deb.	72–75	..	4 0 0
2,600,000	,,	,,	3½					
4,062,235	,,	,,	4					
4,674,850	,,	Dec. 12	3					
258,740	Stk.	Mar. 13	5	Hastings & St. L. 3½ p.c.		83–91	..	5 9 11
82,500	,,	,,	6½	Do. do. 5 p.c.		—	..	—
70,000	10	Oct. 11	11	Hongkong & China, Ltd.		16⅞–17½	+½	6 7 6
131,000	Stk.	Mar. 13	7⅜	Ilford A and C		154–155	..	4 18 4
65,780	,,	,,	6½	Do. B		120–122	..	5 0 5
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb.		89–91	..	4 7 11
4,940,000	Stk.	Nov. 14	9	Imperial Continental		171–176	..	5 2 3
1,235,000	Stk	Feb. 13	3½	Do. 3½ p.c. Deb. Red.		85–87	..	4 0 6
230,242	Stk.	Mar. 13	6	Lea Bridge Ord. 5 p.c.		120–123	..	4 17 7

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
661,000	Stk.	Feb. 27	10	Liverpool United A		218–220	..	4 10 11
718,100	,,	,,	7	Do. B		155–157	..	4 9 2
306,083	,,	Dec. 30	4	Do. Deb. Stk.		98–100	..	4 0 0
63,480	Stk.	Jan. 16	3	Maidstone 3 p.c. Deb.		68–70	..	4 5 9
75,000	5	Nov. 28	6	Malta & Mediterranean		4½–4⅝	..	6 6 4
250,000	100	April 1	4½	Met. of Melbourne	4½ p.c. Deb.	98–100*	+1½	4 10 0
541,920	20	Oct. 30	3½	Monte Video, Ltd.		12⅜–13½	..	5 5 8
1,775,892	Stk.	Feb. 27	4½	Newc'tle&G'tesh'd Con.		98½–99½	–1	4 9 7
529,705	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.		85–86	..	4 1 5
55,940	10	Feb. 27	7/7/0	North Middlesex 7 p.c.		13–14	..	5 4 7
300,000	Stk.	Nov. 28	8	Oriental, Ltd.		125–130	..	6 3 1
60,000	5	Mar. 28	10	Ottoman, Ltd.		8–8⅛*	..	5 17 8
60,000	50	Feb. 27	13	Portsea, Island B		125–128	..	5 1 7
100,000	50	,,	12	Do. C		122–125	..	4 16 0
249,980	5	Oct. 11	8	Primitiva Ord.		6½–7	..	5 14 4
499,960	5	Dec. 30	5	,, 5 p.c. Pref.		4½–5½	..	4 17 7
521,600	100	Dec. 2	4	,, 4 p.c. Deb.		96–98	..	4 1 8
346,198	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.		92–94	..	4 5 1
275,000	5	Apl. 12	12	San Paulo, Ltd.		13–14	..	4 5 9
150,000	10	Sept. 27	6	Do. 6 p.c. Pref.		11½–12	..	5 0 0
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.		49–51	..	4 18 0
135,000	Stk.	Mar. 13	10	Sheffield A		224–226	–2	4 8 6
209,984	,,	,,	10	Do. B		223–225	–1	4 8 11
523,500	,,	,,	10	Do. C		225–225	..	4 8 6
90,000	10	Sept. 27	7½	South African		10–11	..	6 16 4
6,429,895	Stk.	Feb. 13	5/9/4	South Met., 4 p.c. Ord.		112–114	..	4 15 10
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.		74–77	..	3 17 11
209,820	Stk.	Feb. 27	8½	South Shields Con. Stk.		160–162	..	5 4 11
952,795	Stk.	Feb. 27	6	S'th Suburb'n Ord. 5 p.c.		117–119	..	5 0 10
60,000	,,	,,	5	Do. 5 p.c. Pref.		115–117	..	4 5 6
117,058	,,	Dec. 30	5	Do. 5 p.c. Deb. Stk.		117–119	..	4 4 0
694,740	Stk.	Nov. 14	5	Southampton Ord.		102–105	..	4 15 3
120,000	Stk.	Feb. 13	7½	Tottenham and B	A 5 p.c.	139–142	..	5 2 1
483,940	,,	,,	5⅝		B 3½ p.c.	115–117	..	4 18 3
149,470	,,	Dec. 30	4	Edmonton	4 p.c. Deb.	92–94	..	4 5 1
182,380	10	,,	5	Tuscan, Ltd.		5–6	..	8 6 8
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.		96–98	..	5 2 0
286,476	Stk.	Feb. 27	5	Tynemouth, 5 p.c. max.		115–116	..	4 6 2
255,636	Stk.	Mar. 13	6⅞	Wands-worth	B 3½ p.c.	137–140	..	4 18 2
85,766	,,	Dec. 30	3		3 p.c. Deb. Stk.	63–70	..	4 5 9

Prices Marked * are "Ex. Div."

Bromley Public Lighting.—It was recorded in the "JOURNAL" a fortnight ago (p. 840) that tenders from the South Suburban Gas Company and the Bromley Electric Light Company, for the public lighting, had been referred by the Bromley Town Council to the Highways and Lighting Committee for consideration. The Gas Company's tender has now been accepted; and, as will have been noted, the Council secure under it very substantial advantages.

Sidmouth Arbitration Award.—The amount of the award for the purchase by the Urban District Council of the undertaking of the Sidmouth Gas and Electricity Company, as was recently recorded in the "JOURNAL," was £34,683; but it was then pointed out that to this sum three other amounts would have to be added—the compensation to be paid to the officers of the Company, the costs connected with the arbitration, and the Company's costs for the promotion of their Bill. The award of the Umpire (Mr. A. J. Ram, K.C.) in the matter of the compensation to the officers amounts to £3103; the details being as follows: Mr. Thomas Douglas (Managing Director), £1381; Mr. W. H. Hastings (Secretary), £395; Mr. W. J. Pidsley (Collector), £525; Mr. G. H. Appleyard (Foreman Manager), £590; Mr. W. Start (Fitter), £212.

Birmingham Water Supply.—It is expected that the rapid increase in the consumption of water in Birmingham will shortly compel the Corporation to undertake the laying of another pipe-line (the third) from their gathering and storage works in the Elan Valley to the reservoir at Frankley. Although no definite decision has been arrived at, instructions have been given for estimates to be prepared; and it is believed that the undertaking will involve an expenditure between £400,000 and £500,000. The 25 million gallons of Welsh water which the two existing pipes deliver daily are ample in normal circumstances. But there have been many occasions when the daily consumption has approached 30 million gallons; and on one occasion in the hot summer of 1911 it rose to 30½ millions. In these circumstances, the opinion is widely held that the construction of a third aqueduct cannot be delayed more than a year or two.

Output of Gas in Birmingham.—Dealing with the financial year just closed, the "Birmingham Post" says the Gas Committee have had a very satisfactory twelve months, so far as business is concerned. They have made upwards of 9000 million cubic feet of gas; the output showing an increase of 700 million cubic feet over the previous year, when a record was established. That record, therefore, has been easily beaten; the increase being equal to 8½ per cent. over the figures of the year ended March, 1912. The increase of 700 million cubic feet is, it is pointed out, as much as the total output in two or three Midland towns added together. The output of the Birmingham department is now double what it was twelve years ago. During the year, 7000 additional penny-in-the-slot meters were installed, bringing the total now used under the Birmingham Corporation up to 88,000. The department have 160,000 customers as gas consumers—one-half being ordinary consumers, and the other half penny-in-the-slot customers. The total shows a considerable increase over the previous year.

Gas Profits at Doncaster.—At the meeting of the Doncaster Town Council last week, it was decided that £5000, part of this year's net revenue from the gas undertaking, should be transferred to the credit of the borough fund account. In making his annual financial statement, Alderman Bentley (the Chairman of the Finance Committee) pointed out that this sum in respect of the past year must be considered a satisfactory one to hand over, in view of the comparatively low charge of 2s. 2d. per 1000 cubic feet for gas used for domestic purposes, and the increased cost of coal and materials. In the current year, the sum of £15,626 was estimated as necessary for the extension of the plant and mains.

The Directors of the Imperial Continental Gas Association recommend a dividend of 4½ per cent. for the half year ended Dec. 31, less tax, on the £4,940,000 stock of the Association. A year ago the dividend declared was at the same rate.

The Brentford Urban District Council have been informed that the Finance Committee of the Metropolitan Water Board would recommend the Board not to issue precepts to the local authorities for the recovery of the deficit on the Board's account until the sanction of Parliament has been obtained.

"Travelling through beautiful scenery at night makes no impression; but if a flash of lightning comes, some outline is seen," said the Rev. C. C. Dickson, in his sermon at St. Margaret's Parish Church, Plumstead, S.E., on the 30th ult. Immediately the wire of the electric light over the pulpit fused with a vivid flash, illuminating the church, which had been partly darkened during the sermon.

The fusing of an underground cable, followed by a cloud of smoke and the extinction of the electric lights, in Shields Road, Byker, was, we are told, the cause of not a little excitement in the east end of Newcastle on Monday night last week. The trouble was quickly remedied by the Electric Supply Company, but while it lasted it was very inconvenient for some of the shopkeepers and picture palaces.

Messrs. Thomas Piggott and Co., Limited, of Birmingham, have secured the right of manufacture, in the greater portion of England and Wales, of a new and simple arrangement of guides for spiral gasholders, "which will simplify erection and lessen the cost;" and they have secured an order for the erection of such a holder in a steel tank for the Haverfordwest Town Council. The work has been designed by, and will be carried out under the supervision of, Mr. J. Gibbons, the Council's Gas Manager.

Messrs. Poultons and Timmis, Limited, carbonizing engineers, of London, Reading, and Manchester, have sent us a copy of a booklet they have just issued in connection with recent works they have undertaken, giving statistics of the operation of the settings. The booklet, which will be forwarded on receipt of application, also contains particulars, with coloured illustrations, of Mason's recuperative block and tiles, and also a number of illustrations of furnace ironwork, retort mountings, bench bracing, and tools.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

WORKING MANAGER. No. 5719.
CHIEF CLERK. No. 5717.
MECHANIC. No. 5720.

Appointments, &c., Wanted.

LEADBURNER. No. 5715.
LONDON GAS OR MANUFACTURER'S OFFICE. No. 5714.
REPRESENTATIVE (Gas Lighting and Heating Specialities). No. 5722.

Plant, &c. (Second-Hand), For Sale.

BRICK PLANT MACHINERY. Leeds Gas Department. Tenders by April 19.
GASHOLDER. Slough Gas Company. Tenders by April 22.

Gas-Works for Sale (Narberth).

J. H. SILCOX, Park View, Swansea.

Plant, &c. (Second-Hand), Wanted.

EXHAUSTER AND ENGINE. No. 5704.
PIPE TROLLEY. No. 5721.

Tank Trucks for Hire.

FREDK. G. HOLMES AND CO., Northfleet.

Stocks and Shares.

ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY. London Mart. April 15.
DORKING GAS COMPANY. London Mart. April 15.
ST. MARGARETS GAS COMPANY. London Mart. April 15.
SOUTHAMPTON GAS COMPANY. By Tender. April 15.
UXBRIDGE GAS COMPANY. London Mart. April 15.
WYVENHOE GAS COMPANY. London Mart. April 15.

TENDERS FOR

Benzol, Crude (Wanted). No. 5718.

Coal.

COMMERCIAL GAS COMPANY. Tenders by April 17.
INVERNESS GAS DEPARTMENT. Tenders by April 28.

Gasholder (Re-Sheeting).

NEWRY GAS DEPARTMENT. Tenders by April 25.

General Stores (Lead, Lead Pipe, Lime, Flags, &c.)

INVERNESS GAS DEPARTMENT. Tenders by April 28.
LEEDS GAS DEPARTMENT. Tenders by April 19.
WIGAN GAS DEPARTMENT. Tenders by April 15.

Mantles.

CALCUTTA CORPORATION. Tenders by May 12.

Pipes (Iron, Brass, and Copper), &c.

LEEDS GAS DEPARTMENT. Tenders by April 19.
WIGAN GAS DEPARTMENT. Tenders by April 15.

Retort Castings.

LEEDS GAS DEPARTMENT. Tenders by April 19.

Tar and Liquor.

MARPLE GAS DEPARTMENT. Tenders by April 17.
WIGAN GAS DEPARTMENT. Tenders by April 15.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 171, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

TANK TRUCKS FOR HIRE.
FREDK. G. HOLMES AND CO.,
Thames Tar-Works, NORTHFLEET.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, London, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,
NYMEGEN, HOLLAND.

GENERAL MANAGERS—
London and South of England:
W. T. P. CUNNINGHAM,
13, Arcadian Gardens, Wood Green, LONDON, N.
North of England, Midlands, and Wales:
J. BROWN & CO., LTD., Savile Town, DEWSBURY.
Scotland and Ireland:
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

OXIDE OF IRON.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
"KLEENOFF." THE COOKER CLEANER.
BALE & CHURCH, LTD.
5, CROOKED LANE, LONDON, E.C.

TAR WANTED.
THOMAS HORROCKS & SONS, LTD.,
Albert Chemical Works,
GRANT STREET, MILES PLATTING, MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the *best*. Satisfaction Guaranteed.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in advance. If credit is taken, the charge is 25s. a year.
Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING FLEET, LONDON." Telephone: P.O. 1571a Central.

POULTONS & TIMMIS, Ltd.

CARBONIZING and Boiler Setting Engineers, Complete Installations undertaken. Their Retort Settings are THE best.
GUARANTEED RESULTS.
Registered Office: READING. Telephone: 265 Reading.
London Office: HALTON HOUSE, 20/23, HOLBORN. Telephone: 2619 Holborn.
Manchester Office: 55, CROSS STREET.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, FEN. LONDON."
Telephone: 1588 AVENUE (3 lines).

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED.
Works: OLDBURY, WEDNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY, WORCS.
Telegrams: "CHEMICALS, OLDBURY."

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement p. 71.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS.
18 & 20, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "DACOLIGHT LONDON." Telephone: 2336 HOLBORN.

ENQUIRIES SOLICITED.

FOR Gas-Works Plant of Every Description; also SULPHATE OF AMMONIA and SULPHUR RECOVERY PLANTS.
C. & W. WALKER, LIMITED,
DONNINGTON, NEWPORT, SALOP.

TAR Wanted.
FREDK. G. HOLMES AND CO., Tar Distillers, Thames Tar Works, NORTHFLEET.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: "SATURATORS BOLTON." Telephone 0848.

AMMONIACAL Liquor Wanted.
CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Church Fenton, near LEEDS.

PATENTS AND TRADE MARKS PUBLICATIONS: "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

FOR Renovating Cooking Utensils and Polishing Gas-Cookers and Gas-Fittings, read Canning's Handbook on Electro-Plating and Polishing. Fully illustrated, Price 2s. 3d., post free; abroad, 2s. 6d.
W. CANNING AND CO., BIRMINGHAM, and 18, St. John's Square, Clerkenwell, LONDON.

THE HELM LAMP COMPANY,
BOND STREET, NUNEATON.
Contractors for HIGH-PRESSURE MAINS, SERVICES, GOVERNORS, and all WORK connected with HIGH-PRESSURE DISTRIBUTION. We supply complete equipment and guarantee results. We can refer you to work done. The biggest scheme in Europe has recently been entrusted to us. Telephone 29.

SULPHURIC ACID — Specially prepared for Sulphate of AMMONIA and BENZOL Recovery Plants. JOHN NICHOLSON & SONS, LTD., Hunslet Chemical Works, LEEDS. Tele.: "NICHOLSON, LEEDS." Telephone: (Two Lines), Nos. 2420 and 2421.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the Enrichment of Gas.
Manufactured and Supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agents, F. J. NICOL & Co., Pilgrim House, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

DISMANTLING Gas Plant.—Gas Companies having Old Plant to Dispose of or to Dismantle, either for Purchase or Removal, FIRTH BLAKELEY, SONS, AND CO., LIMITED, Church Fenton, Leeds, are prepared to Contract for the same.

TO GAS AND WATER OFFICIALS.

BEFORE Purchasing your 1913 Cycle, kindly send post-card for our CATALOGUE. Cash or gradual Payments. Speciality, Slot-Meter Copper Collector. MELROSE CYCLE CO., COVENTRY.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 years. References given to Gas Companies.

J. E. C. LORD, Ship Canal Tar-Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

J. S. WITHERS & SPOONER, Chartered Patent Agents, 323, High Holborn, London. British, Foreign, and Colonial Patents, Trade Marks, and Designs obtained at moderate and inclusive charges. Every description of business connected with Patents undertaken. Send for free copy of our "GUIDE TO PATENTS, Trade Marks and Designs," Sixth Edition, 1913, just published. Established 29 years.

HUTCHINSON BROTHERS, Ltd.,
FALCON WORKS, BARNSLEY,
MANUFACTURERS OF
GAS METERS (ordinary and prepayment).
MAIN COCKS, &c.
"FALCON" INVERTED LAMPS, for street lighting.
"ZENITH" INVERTED LAMPS, for outside shop, &c., lighting.
"FALCON" INVERTED BURNER LANTERNS.
SQUARE STREET LANTERNS.
BURNERS and CONVERSION SETS for street lanterns, &c., &c.

WANTED—Employment in London Gas or Manufacturer's Offices. Advertiser's Services would be valuable where a considerable quantity of printed matter is used. Could be useful in a Position at forthcoming Gas Exhibition. Is personally known to Mr. King.
Address No. 5714, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

EXPERIENCED Leadburner and Chemical Works Plumber is OPEN FOR ENGAGEMENT. Tower, Chamber, or Saturator Builder. All kinds of Repairs done on Short Notice. Plant and all Tools Found. Any Distance.
Address, No. 5715, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

REPRESENTATIVE, with Exceptional Experience at Home and Abroad, used to big Turnover, shortly DISENGAGED, Desires APPOINTMENT with Leading Manufacturer of Gas Lighting and Heating Specialities.
Address No. 5722, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, in South Wales, a Working MANAGER for Gas-Works (3 Millions). Wages 30s., with House (in Town), Coal, and Gas Free. Used to Regenerative Settings. Must be Good Fitter (compo. or iron) and Stoker. None but thoroughly Practical and Energetic Men need apply.
State Age and send *copies* only of Two recent Testimonials to No. 5719, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Near London, an Experienced MECHANIC with First-Class Training in Machine shop, Engines (Steam and Gas), Pumps, and General Fitting. Age not to exceed 32 years. A non-contributory Pension Scheme is in operation, and one week's holiday, with full pay, is given each Year. Only First-Class men need apply.
Apply, by letter, stating Age, Wages, Experience, and References, to No. 5720, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Capable Man as Chief CLERK of Gas-Works Office. Thoroughly efficient. Early Riser.
Full Particulars, Age, Wages required, with *copies* of Three Recent Testimonials, by April 11, to No. 5717, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Second-Hand Exhauster and ENGINE Complete, to pass 40,000 Cubic Feet per Hour.
Particulars to No. 5701, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

PIPE Trolley Wanted for Carting Heavy Pipes. Must be of Best Design and Make.
Particulars to No. 5721, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CRUDE Benzol Wanted in Sellers' Tanks. Large Quantities. Good Prices given.
Address No. 5718, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FREEHOLD GAS-WORKS FOR SALE.

FOR SALE, by Tender, as a Going Concern, the Old-Established GAS-WORKS at Narberth, Pembrokeshire.
Full Details and Particulars, together with Cards to View, may be obtained of Mr. J. H. Silcox, Park View, Swansea, to whom Tenders must be sent on or before May 1 next.
The highest or any Tender not necessarily accepted.

LEEDS CORPORATION GAS-WORKS.

THE Gas Committee are prepared to receive OFFERS for the Purchase of the BRICK PLANT MACHINERY at the New Wortley Works, consisting principally of the following:—
Two 8 ft. GRINDING PANS.
One 9 ft. TEMPERING PAN.
One Two-Mould TOGGLE PRESS.
Two STEAMING CHAMBERS, 35 ft. by 6 ft. 6 in. diameter.
One STEAM-ENGINE.
Various ELEVATORS, WORM CONVEYORS, &c., &c.
Offers to include the Cost of Dismantling and Removal of the Machinery.
Full Particulars can be obtained on Application to the Manager of the New Wortley Works.
Offers, suitably endorsed, addressed to the Town Clerk, Pearl Chambers, Leeds, to be Delivered not later than Saturday, the 19th inst.
R. H. TOWNSLEY,
General Manager.
Gas Offices, Market Hall,
Leeds, April 5, 1913.